Form 1100-001
(R 12/09)

NATURAL RESOURCES BOARD AGENDA ITEM

Item No. 3.B.3

SUBJECT: Request adoption of Board Orders IS-47-10 and IS-07-11(E), revisions to ch. NR 40, regarding the management of Geomyces destructans, the fungus associated with white-nose syndrome in bats

FOR: DECEMBER 2010 **BOARD MEETING**

TO BE PRESENTED BY: Erin Crain - Section Chief, Dave Redell - Bat Ecologist

SUMMARY:

White-nose syndrome (WNS) is a disease responsible for unprecedented mortality in cave hibernating bats, identified by the white fungus (Geomyces destructans) that grows on the nose, ears, and muzzle and/or wing membranes of affected bats. Since detection in 2006, WNS has been found in 14 states and 2 Canadian provinces, spreading up to 800 miles in the last year. WNS has been linked to the death of over one million bats since 2007 and threatens to cause the extinction of several bat species in the near future. Mortality rates of affected colonies reach 100%. All WI cave bat species are mortally affected by WNS.

To effectively manage G. destructans, the fungus associated with WNS in bats, the department proposes additions to ch. NR 40 for early detection and monitoring of G. destructans and preventive measures to limit its potential spread. Implementing the proposed rules before G. destructans has been detected here will allow the department time to work collaboratively with stakeholders to ensure that appropriate conservation measures are in place. Because of the rapid spread of G. destructans, the department would not have time to develop appropriate conservation measures if these rules were delayed until after the fungus was detected in Wisconsin. Based on the current location and known rate of spread of the disease, it is likely that G. destructans will be detected in Wisconsin as early as January 2011.

The proposed rules allow specified department actions in the unlikely event that requested voluntary cooperation is not obtained, including access (with a court warrant) to caves or mines to survey for the presence of G. destructans. Decontamination of gear used in or near caves or mines and development of prevention plans by certain cave or mine owners are also called for. Affected parties include commercial caves/mines, private cave/mine owners, active underground mines, recreational cavers, agriculture and forest industries, and the conservation community. The department will update the board on an annual basis regarding the effectiveness and necessity of the G. destructans management actions.

RECOMMENDATION: Request adoption of Board Orders IS-47-10 and IS-07-11(E), revisions to ch. NR 40, regarding the management of Geomyces destructans, the fungus associated with white-nose syndrome in bats.

LIST OF ATTACHED MATERIALS:

No	☐	Fiscal Estimate Required	Yes	☑	Attached
No	☐	Environmental Assessment or Impact Statement Required	Yes	☑	Attached
No	☐	Background Memo	Yes	☑	Attached

APPROVED:

Craig Thompson — Bureau Director, — Date 12/3/10

Laurie Ostrowski — Administrator, — Date 12/3/10

Matt Frank — Secretary, Matt Frank — Date 12-3-10

cc: Laurie J. Ross - AD/8
Craig Thompson - ER/6
Erin Crain - ER/6
Rori Paloski - ER/6
Tara Bergeson - ER/6
Lance Potter - ER/6
Gregor Schuuman - ER/6
David Redell - ER/6
Peter Flaherty - LS/8
Tim Andryk - LS/8
Linda Haddix - LS/8

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: December 3, 2010

TO: Natural Resources Board

FROM: Matthew J. Frank
Secretary, Department of Natural Resources

SUBJECT: Request adoption of Board Orders IS-47-10 and IS-07-11(E), revisions to ch. NR 40, regarding the management of Geomyces destructans, the fungus associated with white-nose syndrome in bats

Background

Bats are a vital part of many ecosystems and white-nose syndrome (WNS) has significant environmental, economic, and public health impacts. All bats affected by WNS are insectivorous and a single little brown bat can eat up to 1,000 insects per hour, often consuming large numbers of agricultural pests, which cost the agriculture and forest industry billions of dollars per year. As insect predators, bats also may play an important role in reducing risk of human disease transmitted by flying insects.

Wisconsin has one of the highest concentrations of cave bat hibernacula in the Midwest, and large numbers of cave bats from neighboring states including Illinois, Iowa, Minnesota, Michigan and Indiana hibernate in Wisconsin. Three Wisconsin hibernacula alone house over 300,000 bats. Wisconsin's largest known hibernaculum, Neda Mine, may also be the largest in the Midwest with an estimated population of 150,000.

Bats affected with WNS were first observed in 2006 at a single cave near Albany, New York. WNS has since been found in 14 states and two Canadian provinces, spreading up to 800 miles in the last year. Mortality rates of affected colonies reach 100%. WNS has been linked to the death of over one million bats since 2007 and threatens to cause the extinction of several bat species in the near future. According to a Consensus Statement issued at the WNS Emergency Science Strategy Meeting in May 2009, white-nose syndrome "... has caused the most precipitous decline of North American wildlife in recorded history." Last spring, the disease was detected within 225 miles of Wisconsin's southern border and 300 miles from the northern border. That means a WNS-infected cave is now located within the 280-mile dispersal range of Wisconsin little brown bats. Based on the disease's current location and known rate of spread, we anticipate the detection of WNS in Wisconsin as early as January 2011.

Hibernating bats are susceptible to WNS. Those infected tend to show a white fungal growth on their face, arms, legs, wings, or tail caused by the newly isolated and named fungus, *Geomyces destructans*. Infected bats exhibit atypical behavior such as daytime activity during winter hibernation, which rapidly depletes stored energy reserves. Wing damage and emaciation are also common.

To date, nine species of cave bats are affected by WNS, including the federally endangered Indiana bat, which historically was found in Wisconsin. All Wisconsin cave bats, which include the little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*), are among the species fatally affected by white-nose syndrome. Consequently, Wisconsin's cave bat population as a whole is threatened by this devastating

Printed on Recycled Paper

disease. The little brown bat is Wisconsin's most common bat species and because this species has seen the greatest mortality rate due to WNS, Wisconsin anticipates significant impacts to its cave bat populations when WNS begins to affect Wisconsin bats. Research published in the journal *Science* (August 2010) states "...we expect a 99% chance of regional extinction of little brown myotis within the next 16 years."

Research conducted at the United States Geological Survey (USGS) Wildlife Health Center has shown that *G. destructans* is transferred from bat to bat, and a multi-agency project demonstrated bats can develop WNS through infection directly from an affected cave environment in the absence of infected bats.

There is also evidence of human transfer of *G. destructans* from site to site and/or bat via contaminated equipment, gear or clothing. There have been long-distance jumps in the spread of WNS, beyond the distance bats would likely transmit the disease. These "jump" sites have been frequently visited caves often with small bat populations. The USGS National Wildlife Health Center has detected *G. destructans* fungal spores in cave sediment demonstrating persistence of the fungus in the absence of bats. The New York Department of Environmental Conservation, Wildlife Pathology Unit has isolated *G. destructans* fungal spores on equipment and clothing after exiting an affected cave.

Even in the face of incomplete information, general epidemiological principles should be used to inform the WNS investigation and response. All available evidence indicates that WNS is caused by an infectious agent and can therefore potentially be spread by all known modes of disease transmission, including direct contact, inhalation, ingestion, fomites (inanimate objects), and human or animal vectors. Wildlife diseases such as WNS spread rapidly when there is a high prevalence of pathogen(s), an efficient chain of transmission, an abundance of susceptible hosts, and/or an environment that allows pathogen persistence without a host. Regardless of the infectious agent (fungus, bacterium, or virus), universal precautions should be implemented. Universal precautions are procedures and guidelines designed to reduce incidence of disease by both preventing infections and breaking chains of transmission.

The department recognizes the critical role that landowners and stakeholders can play in assisting and cooperating with this scientifically grounded approach to conserving Wisconsin's natural heritage and critical ecosystem services in the face of an unprecedented challenge. The department has been establishing volunteer agreements with hibernacula owners, conducting stakeholder meetings, working with volunteer monitors, consulting with the United States Geological Survey and Fish and Wildlife Service, and implementing an education and outreach program.

Rule Summary

IS-47-10

Chapter NR 40, Wis. Admin. Code, establishes a classification system for invasive species and regulates those in the prohibited and restricted categories. It also establishes preventive measures that when followed, will help minimize the spread of invasive species into or within Wisconsin. In a previous emergency rule, the department listed *Geomyces destructans* in s. NR 40.04 as a prohibited invasive fungus species. *Geomyces destructans* has been identified as the fungus associated with white-nose syndrome (WNS) in cave bats. Because the department has little if any control over the natural movements of bats, the main focus in WNS management is on limiting the anthropogenic spread of *G. destructans*.

This proposed Order, which has been revised from the public hearing version in light of public comments, Rules Clearinghouse comments, meetings with stakeholders and our own continuing review, adds provisions to ss. NR 40.04 and 40.07 relating to early detection and prevention of the introduction and spread of WNS due to anthropogenic activities, as follows:

1. For purposes of early detection, with permission or pursuant to an inspection warrant, department staff may access caves and mines in order to monitor, survey, and inspect for the presence of *G. destructans*.
2. Equipment, gear, clothing and other objects may not be brought or placed into or near a cave or mine if they have been in or near a cave or mine located outside of Wisconsin.
3. Equipment, gear, clothing and other objects that have been in or near a cave or mine located in this state must be cleaned following department-approved protocols before they can be brought into another cave or mine in this state.
4. The cleaning process for all equipment, gear, clothing and other objects that have been in or near a cave or mine in Wisconsin must begin immediately upon exit following department-approved protocols.
5. All equipment, gear, clothing and other objects that will be or have come in contact with bats (including, but not limited to nets, traps, weighing tubes, bat bags, wing punches, rulers, clothing, gloves, electronic equipment and exclusion materials) and all individuals handling bats must be decontaminated prior to and immediately after contact.
6. Owners and operators of commercial caves and mines must ensure that their visitors comply with department-approved cleaning protocols.
7. Owners and operators of certain caves and mines must develop and implement a department-approved, site-specific plan setting out practices that they will follow for the prevention of the introduction and transmission of *G. destructans*.

The Order also adds key definitions and sets out authority for the department to grant written exemptions from the new prohibitions and cleaning requirements if the exemption will not significantly increase the risk that *G. destructans* would be introduced or transported to other locations. Conditional exemptions may be issued, and the conditions will have the force of law.

<u>IS-07-11(E)</u>

At the same time that it authorized public hearings on proposed permanent rule IS-47-10, the Board adopted an identical emergency rule (IS-49-10(E)) effective Nov. 3, 2010. Because significant revisions have been made to the proposed permanent rule, it is now necessary to conform the emergency rules created by IS-49-10(E) to conform them to the revised, proposed permanent rule.

SECTION 1. of this order repeals a definition that has been recreated in another section of the chapter, as recommended by the Rules Clearinghouse.

SECTION 2. of this order amends the common name used to describe *G. destructans*, in response to a recommendation by the Rules Clearinghouse.

SECTION 3. of this order repeals and recreates a subsection in NR 40.07 created by IS-49-10(E). It contained a series of decontamination requirements and a procedures by which the department could order owners and operators of caves and mines to exclude either people or bats. The recreated subsection contains similar requirements for the cleaning of equipment, gear and other objects, but further specifies that owners and operators of commercial caves and mines must ensure that their visitors comply with

department-approved cleaning protocols. The recreated subsection also replaces the administrative order procedures with a prevention plan requirement. Owners and operators of certain caves and mines must develop and implement department-approved, site-specific plans detailing the practices that they will use to prevent the introduction and transmission of *G. destructans*.

Rule Development

These rule changes were developed with the assistance of the Bureaus of Endangered Resources and Legal Services. Department of Justice advice was also sought and confirmed the need to put the proposed measures into rule. The department has also recently met with stakeholders, including mine and commercial cave owners to discuss white-nose syndrome and possible management options. All known cave and mine owners in Wisconsin were contacted this year to provide background information on WNS and cave management.

Recommended Public Participation

The department held four public hearings on the proposed changes to ch. NR 40, Wis. Admin. Code (Rule Order IS-47-10). Hearings were held on November 29 (Madison, Green Bay, Eau Claire, Wausau). The hearings were held concurrently with hearings to list the four cave bats as threatened species in ch. NR 27, Wis. Admin. Code (Rule Order ER-35-10) and hearings to list the fungus, *Geomyces destructans*, as prohibited invasive species in s. NR 40.04(2), Wis. Admin. Code (IS-41-10).

Hearing Synopsis and How the Rule Was Revised After Public Hearing

See the attached Public Hearing Synopsis for a summary of significant public comments and the department's responses to those comments. Based on public comments, rules clearinghouse comments, meetings with stakeholders and our own continuing review the proposed rule has been revised.

Rules Clearinghouse Comments

1. Statutory Authority
Section 66.0119, Stats., authorizes a state officer, agent, or employee, having statutory authority to inspect real or personal property for environmental purposes, to apply for, obtain, and execute an inspection warrant. A warrant may be issued for inspection of personal or real properties that are not public buildings upon showing consent to entry for inspection purposes has been refused. Section NR 40.07 (8) (e) 2. and 4. provides that the department or its designee may, if it does not receive an owner's consent to enter property, seek an inspection warrant and install and maintain physical barriers to limit access to a cave or mine by either individuals or bats. If the department intends to use a special inspection warrant under s. 66.0119, Stats., it should more fully explain its authority to go beyond the inspection purposes of the warrant and to actually install and maintain physical barriers. If the department intends to ask for an inspection warrant under another section of the statutes, it should

Department Response: The comment has become moot due to revision of s. NR 40.07 (8) (e). The rule no longer calls for the use of inspection warrants.

2. Form, Style and Placement in Administrative Code

a. Section NR 40.02 (28m) defines the term "near" for purposes of s. NR 40.07 (8). Since this term only appears in s. NR 40.07 (8), the definition should be created in par. (a) of that section.

Paragraph (a) should read: "(a) Definition. In this subsection "near a cave or mine" means within 100 feet of a cave or mine." The remaining paragraphs should be renumbered accordingly and the titles to the paragraphs should be shown in italics.

b. Section NR 40.07 (8) (b) 1. and 2. should begin with the phrase "Except as provided in subd. 4. and par. (d),". Also, in par. (b) 1., the phrase "the state" should be replaced by the phrase "this state." Finally, in par. (b) 3., the phrase "but not limited to" is unnecessary and should be deleted.

c. In s. NR 40.07 (8) (c), a comma should be inserted after the reference "1."

d. In s. NR 40.07 (8) (e) 3., the phrase "negotiated under subd. 2." should be inserted after the phrase "consent order."

Department Response: The comments have been accepted and the rule has been revised accordingly.

5. Clarity, Grammar, Punctuation and Use of Plain Language

a. Sections NR 40.03 (3m) and 40.07 (8) (d) contain the phrase "*Geomyces destructans (white nose syndrome)*." Because the fungus is thought to cause or relate to white nose syndrome, but is not synonymous with it, the phrase "(white nose syndrome)" should be replaced by the phrase ", the fungus causing or relating to white nose syndrome."

Department Response: Comment 5.a. has been accepted in part. Rather than follow the exact style suggested by the Clearinghouse, "*Geomyces destructans* (white nose syndrome)" has been replaced in the proposed rule by "*Geomyces destructans* (white-nose syndrome fungal pathogen)" in order to maintain consistency with other ch. NR 40 invasive species scientific and common name descriptions.

b. Section NR 40.07 (8) (e) provides in part that a person who owns, controls, or manages property where a cave or a mine may be present, is responsible for limiting access to the cave or mine by either individuals or bats. The phrase "is responsible for limiting" should be replaced by the phrase "shall limit." Also, if the intended meaning of this provision is that an owner or manager will have this duty only if it asks the manager or owner to install and properly maintain physical barriers to limit access, this provision should explicitly so state. Finally, the note to this provision appears to be substantive and should be incorporated as a standard in the text of the rule.

Department Response: has been accepted in part and has become moot in part due to revision of s. NR 40.07 (8) (e).

Small Business and Final Regulatory Flexibility Analysis

The rule is not expected to have a significant adverse effect on a substantial number of small businesses. Therefore, under s. 227.19 (3m), Stats., a final regulatory flexibility analysis is not required. The rule may have favorable effects on a number of businesses by preventing the introduction or limiting the spread of WNS, thereby preserving the agricultural, economic and environmental benefits associated with healthy bat populations.

There are approximately 120 known bat hibernacula in Wisconsin, and approximately 12 of these are public caves. In addition, less than 20 of the caves and mines in Wisconsin are routinely caved.

Affected constituencies include commercial caves and mines, active underground mines, private cave and mine owners, recreational cavers, agriculture and forest industries, and conservation organizations. Concerns will likely include how the proposed rules will affect current activities. Many of these potential concerns may be addressed through cost-sharing, technical support, and education provided by the department. Examples include: cost-sharing for installation of bat-friendly gates or other physical barriers, cost-sharing for conservation actions, providing cave closure signage and cleaning protocols, and providing locations of caves that may be used for recreational caving activities (where bats are known to have been excluded). Agriculture industries, forest industries and conservation organizations would be negatively affected by not attempting to control or slow the spread of WNS.

The cost of cleaning equipment, gear, clothing and other objects will be minimal. The cost of caving gear typically ranges from $125-$750. Very few sites in Wisconsin require vertical climbing gear. The cost of commercially cleaning gear according to department protocols typically ranges from $10 to $12 per set of gear. The cost of signage at caves and mines would be $0 because the department will provide the signs.

Under current ch. NR 40, the department may ask any person who owns, controls, or manages property where a prohibited species is present to control the prohibited species in accordance with a plan approved by the department. While a person who owns, controls, or manages property where a prohibited species is present is responsible for controlling the prohibited species that exists on the property, the department will seek funds to assist in the control of prohibited species.

The department will normally follow an informal, stepped enforcement process in order to obtain compliance with invasive species rules. This involves informal discussions between department staff and the individual, landowner or company, notifying the person of potential violations and providing guidance on how to comply with the rules. Notices of non-compliance may follow if necessary. If formal enforcement is necessary, ch. NR 40 will be enforced by department conservation wardens, county district attorneys, and circuit courts through the use of citations and civil or criminal complaints. Civil and criminal enforcement may also be carried out by department referral of violations to the Wisconsin Attorney General, with prosecution and abatement actions in the circuit courts. Criminal enforcement will be limited to intentional violations. Finally, violations of the permits issued under ch. NR 40 also may be enforced by administrative permit revocation proceedings.

Environmental Analysis

This rule revision is considered to be a Type III Action under s. NR 150.03 (6) (a) 3. b, and therefore does not require preparation of an environmental assessment. However, in the interest of providing the public with complete information on this rule change, the department has prepared an environmental assessment (see attached).

Hearing Synopsis
Summary of Public Comments and Department Responses
IS-47-10

The department held four public hearings on the proposed changes to ch. NR 40, Wis. Admin. Code (Order IS-47-10). Hearings were held on November 29 (Madison, Green Bay, Eau Claire, Wausau). The hearings were held concurrently with hearings to list the four cave bats as threatened species in ch. NR 27, Wis. Admin. Code (Order ER-35-10) and hearings to list the fungus, *Geomyces destructans*, as a prohibited invasive species in s. NR 40.04(2), Wis. Admin. Code (Order IS-41-10).

Comments were combined for all three orders (ER-35-10, IS-41-10 and IS-47-10). A summary of the comments is provided in the table below. In general, those providing testimony did not identify specific rules but rather referred to the whole set of rules that they supported or opposed. Consequently, if comments contained opposition to any portion of the rules, the comments were considered in opposition to the whole group of rules. There were 208 comments (75%) in support of the rules and 71 comments (25%) opposed.

Support	208	(203 Wisconsin residents, 5 nonresidents)
Oppose	71	(40 Wiseonsin residents, 31 nonresidents)
Support/Oppose	3	(1 Wisconsin resident, 2 nonresidents)
Total	282	

General Comments

Comment: Public hearings should have been held.

Response: Public hearings were held for the proposed rules. The department held five public hearings on two of the board orders (ER-35-10 and IS-41-10). Hearings were held on October 26 (Fitchburg) and November 29 (Madison, Green Bay, Eau Claire, Wausau). The four November 29 hearings were held concurrently with the remaining board order (IS-47-10).

Comment: Appropriate public comment periods were not held.

Response: The public comment period for board orders ER-35-10 and IS-41-10 was approximately 60 days and the public comment period for board order IS-47-10 was approximately 30 days.

Comment: The DNR should have contacted more stakeholders.

Response: Department staff have provided WNS updates, decontamination protocols, and instructions for public comment on the proposed rules to many stakeholder groups including the caving community, landowners, animal control operators, wildlife rehabilitators, conservation organizations, partner agencies and the agricultural industry. The department has also posted instructional videos regarding decontamination, the proposed regulation, and the science concerning white-nose syndrome. It has also worked directly with stakeholders on changes to the broad incidental take permit and has solicited public

comment on a voluntary environmental analysis which regards the impact of the proposed rules on the environment. Further, the department has worked on an individual basis with commercial cave and mine owners to develop site specific prevention plans.

Comment: The DNR should wait to take action until WNS has been detected in Wisconsin.

Response: Proposing these three rules before WNS has been detected in Wisconsin will allow the department time to work collaboratively with stakeholders to ensure that appropriate conservation measures, such as the protection of refuge hibernacula, are developed and in place in the event that WNS affects Wisconsin.

Comment: The DNR has stated that based on the current location and known rate of spread of the disease, it is likely that WNS will reach Wisconsin as early as January 2011. Based upon my understanding of the disease, this statement is incorrect. If WNS appears in January 2011, then it is probably already there.

Response: That is correct. We have clarified our language to say that WNS may be *detected* in Wisconsin as early as January 2011.

Comment: The DNR is spending too much (tax) money on this. Money should go to research rather than management.

Response: Approximately 90 percent of DNR WNS activities have been funded through grants and donations. The DNR has been actively involved in both WNS management and WNS research

Comment: The DNR is not considering how much time they will need to devote to this (e.g., teaching DNR scientists to identify bats, inspecting caves, posting signs, enforcement).

Response: All DNR staff and contractors performing fieldwork have received the necessary training and certifications to carry out the work. Work completed in previous months has narrowed the number of caves identified for early detection, monitoring and inspection, etc. to a number that is manageable. There have been no enforcement actions under the current emergency rules and given the positive responses the department has received from landowners, we do not anticipate a significant increase in enforcement workload.

Comment: A strong bat education program should be in place and/or continue.

Response: The Wisconsin Bat Monitoring Program (WBMP) educates citizens on bat biology and conservation through presentations, trainings, workshops, publicly distributed informational packets (Bat House Handbook, Bat Exclusion Guide, Bat Roost Monitoring Pamphlet), public television appearances, public radio appearances, newspaper articles and public service announcements. The WBMP will continue to strive to increase public awareness and education.

Comment: Sources should be cited in the background memos.

Response: The background memos that are included in the green sheet package for the Natural Resources Board typically just contain a summary of the issue. The environmental assessment that is attached to all three December 2010 green sheet packages (board orders ER-35-10, IS-41-10, IS-47-10) contains a significant number of citations. We have included additional citations in this document as well.

Bat Rule Comments

Bat Exclusion

Comment: Excluding bats from hibernacula will kill them. You can never remove all bats from a hibernaculum – there are too many cracks. Bats can't relocate. Bats shouldn't be excluded in the winter. Even if the bats find another place to hibernate, it will like be sub-par habitat and the process will stress the bats.

Response: The idea of excluding bats from sites where human-to-bat contact is high (e.g. commercial sites) is an effort to reduce the risk of white-nose syndrome transmission by humans to acceptable levels (as seen in the U.S. Fish and Wildlife Service white-nose syndrome draft national plan). The exclusion concept has been suggested in the U.S. Fish and Wildlife Service's most recent white-nose syndrome draft national plan as it relates to disease management. In addition, the Pennsylvania Game Commission has conducted exclusion studies and Kentucky is exploring exclusion as an approach.

The department understands the importance of bats to the cave ecosystem, including providing nutrients from guano or dead bats, and also recognizes that there are potential negative effects of bat exclusion depending on how integral bats are to the cave nutrient cycle at a particular site and the timing of the exclusion. The department is not advocating the exclusion of bats during the hibernation season. In fact, this is a tool intended to be applied in an extremely limited number of high-risk sites; only two bat exclusions have been installed in Wisconsin caves, and both are under voluntary agreements with property owners and involve approximately 80 bats. There has been no evidence of mortality associated with these two exclusions. Additionally, where exclusions have taken place, the department has taken steps to restrict bat movement into the site, but the techniques used to exclude bats allow other organisms (invertebrates) to come and go freely. The cave bats found in Wisconsin do not use caves and mines as summer maternity roost sites, which is where large inputs of nutrients generally occur.

Studies using bat banding records show that all species of cave bats found in Wisconsin visit and assess multiple hibernacula during the fall swarming and mating period. Banded bats have been recovered during this fall period sometimes more than 100 miles between candidate sites in less than two weeks (Humphrey & Cope, 1976; Whitaker and Rissler, 1992). In addition to fall movements by bats there is also banding record evidence of naturally occurring mid-winter movements (Humphrey & Cope, 1976; Whitaker and Rissler, 1992). With white-nose syndrome disease management options under consideration, the midwinter movements have the highest disease transmission risk (G. Turner, PA Game Commission, personal communication with D. Redell). Thus, the Department is not considering exclusions during the winter season and will focus exclusions at these limited number of higher risk sites during the pre-hibernation period. Considering the behavioral timing of bat movement patterns and disease transmission risk, an exclusion of bats prior to their entry in the fall has the highest chance of reducing or eliminating this risk and prevents the bats from entering a site that may have been exposed to the fungus through human transmission. Through fall swarming and natural dispersal exploration, both

male and female bats are familiar with multiple hibernacula throughout the landscape. Excluding bats from a cave before the hibernation period begins gives them time to move to an alternative hibernaculum, and thus bat exclusions are not expected to have a high mortal effect on the bats when implemented early in the fall season.

As well, the majority of Wisconsin's bats currently hibernate in novel structures – mines – to which they historically switched from other hibernacula, and bat-count data from Wisconsin mines suggests that some bats may switch among nearby hibernacula from winter to winter. It is likely that Wisconsin's cave bats historically also hibernated in cavities in very large old-growth trees, and that fact that such sites periodically disappear via senescence or other disturbances clearly favors some flexibility and capacity for adaptation in bats. Strong evidence of such hibernaculum-switching is found in some examples where human wintertime disturbance of hibernating colonies at tourist sites has been reduced, resulting in year-to-year increases in the size of the hibernating colony that could not be explained by reproduction alone; instead, such results are interpreted as indications that regular human disturbance had been causing bats to shift to alternative hibernacula more suitable to their winter needs.

Based on the department's discussions with conservation professionals from federal and other state agencies, banding records, and expert opinion, we maintain that the practice of excluding bats is one of many management options that may be applicable under specific circumstances. It is also consistent with the Bureau of Endangered Resources' Science Guidelines.

Comment: This concept of exclusion hasn't been proposed anywhere else in the country.

Response: The exclusion concept has been suggested in the U.S. Fish and Wildlife Service's most recent white-nose syndrome draft national plan as it relates to disease management: "Identify effective bat exclusion/inclusion of infected sites/uninfected sites". In addition, the Pennsylvania Game Commission has conducted exclusion studies and Kentucky has expressed interest in WDNR's approach.

Comment: Excluding bats will increase the probability of spreading WNS.

Response: Excluding bats from sites where human-to-bat contact is high (commercial sites) is an effort to reduce the risk of white-nose syndrome transmission by humans to acceptable levels (as seen in the U.S. Fish and Wildlife Service white-nose syndrome draft national plan)

<u>Closing Caves/Mines</u>

Comment: Commercial caves, such as Crystal Cave, shouldn't be closed to the public. No other commercial caves in the country, including those operated by the NPS have been closed or even recommended for closure. USFWS does not recommend excluding bats.

Response: The WDNR is working with Crystal Cave and other commercial sites in developing a control plan specific to each site. The control plans may be similar to that of Mammoth Cave National Park which screens visitors and offers decontamination procedures.

Comment: The DNR should only close key hibernacula, similar to what Georgia and Alabama did.

Response: The WDNR will look to minimize disturbance of the threatened cave bat species at all hibernacula and will work to create control plans for all known hibernacula.

Comment: Why is the WI DNR doing more than any other state?

Response: To effectively manage WNS, the WDNR proposed additions to ch. NR 40 (this rule is exclusive to Wisconsin) related to the early detection and monitoring of WNS and preventive measures to limit the potential spread of WNS. Implementing the proposed rules before WNS has been detected in Wisconsin will allow the department time to work collaboratively with stakeholders to ensure that appropriate conservation measures are in place. Because of the rapid spread of WNS, the department would not have time to develop appropriate conservation measures if these rule changes were delayed until after WNS was detected in Wisconsin.

Comment: The other biological resources of caves, in addition to bats, must be considered as well. These species depend on bats and will disappear if you exclude bats.

Response: Where exclusions have taken place, the WDNR has taken steps to restrict bat movement into the site, but the techniques used to exclude bats allow other organisms (invertebrates) to come and go freely. The cave bats found in WI do not use caves and mines as summer maternity roost sites, which is where large inputs of nutrients generally occur.

Comment: Caves shouldn't be sealed – there are archaeological and historical resources inside some of them.

Response: Each site (cave or mine) will have a designated control plan. Sites where exclusion of bats are deemed necessary, will restrict bat movement but may still allow human access (gated entry).

Comment: We shouldn't be closing mines in the state – they contain some of the largest hibernacula in WI.

Response: The WDNR recognizes the critical and dominant role that Wisconsin's active and inactive mines play as bat hibernacula. Every site (cave or mine) is unique, thus a site-specific control plan will be in place for each. The largest hibernacula in Wisconsin are mines and they have strict protocols and preventive measures in place to minimize impacts to these profoundly important wintertime colonies and minimize transmission risks.

Comment: Caves shouldn't be closed to researchers.

Response: Caves will not be closed to researchers as long as they obtain the necessary authorizations and permits. An Endangered/Threatened Species Permit is needed for any work done with the four listed cave bat species or any other listed species. An Invasive Species Permit will be needed for any work involving *Geomyces destructans*. A Scientific Collector's Permit may be needed for work done with non-listed species.

Comment: Caves shouldn't be "sealed".

Response: Where exclusions have taken place, the WDNR has taken steps to restrict either bat or human movement into the site with techniques that allow smaller organisms (e.g., invertebrates) to come and go freely. Each site will have a designated control plan. In accordance with the US Fish & Wildlife Service draft national plan, the WDNR will aim to protect or restore winter habitat to ensure quality habitat is available for WNS-affected bat populations.

WNS Transmission

Comment: Human-to-bat transmission of WNS has not been proven; there are no peer-reviewed journal articles showing this. Human transmission is being assumed to be the primary vector of WNS spread. Bats could be transported by transportation systems (vehicles, boats). If human transmission were likely – we would be seeing WNS in more commercial caves/and or more locations in the country.

Response: The comment that human transmission is assumed to be the primary vector of WNS spread is incorrect. WDNR has worked closely with the USGS National Wildlife Health Center and a number of state natural resources agencies to study *Geomyces destructans* transmission, and these studies have documented both bat-to-bat and cave-to-bat transmission. Human transmission has not been conclusively demonstrated, but the possibility that *Geomyces destructans* can "hitchhike" on humans and their equipment and clothing is recognized and addressed in decontamination protocols produced by U.S. Fish and Wildlife Service, the National Park Service, and others; and widely adopted by agencies, show caves, caving organizations, and others. Scientists consider the human-transmission hypothesis plausible because: 1) The New York State Department of Environmental Conservation has shown that *G. destructans* conidia (asexual, non-motile spores of a fungus) can remain viable for extended periods of time in conditions they would experience while hitchhiking on equipment or clothing between hibernacula (i.e., > 85°F), 2) humans are often vectors of pathogens, including fungal pathogens, 3) WNS movement has in some cases closely tracked documented human movements from infected to uninfected hibernacula, and 4) well understood bat-movement patterns alone do not adequately explain observed patterns of WNS movement (Turner and Reeder 2009). As Turner and Reeder note, "concern over anthropogenic transmission was raised initially in 2008, after discovery that all but two or three new WNS sites found that year had been visited by either biologists or recreational users who had been in at least one of the original four sites noted in 2007. This concern highlighted the need for establishing decontamination protocols, as well as the need to verify that they were effective." Turner and Reeder continue:

> *"Large-scale movements (jumps) of WNS occurred in 2009 into areas where WNS was not thought to exist, leaving sites in between unaffected. These jumps occurred in central Pennsylvania, West Virginia, and Virginia, and several factors pointed toward a human connection. First, most sites had small hibernating populations. Although the possibility existed for spread by an infected bat that had migrated a long distance to a small hibernating population in the new area, it was unlikely that this would have occurred multiple times, particularly when the hibernacula with much larger populations existed nearby, as was the case at several of these newly infected sites. Second, most new sites had very high recreational use, and third, several sites were confirmed to have visitation*

by people or mud-covered gear that had been in affected sites in New York, prior to establishment of decontamination protocols."

Citation:

Turner, G. and D. Reeder. 2009. Update of White Nose Syndrome in Bats, September 2009. *Bat Research News* 53:47-53.

Comment: The fungus does not persist in cave soils, DNR has been misquoting this study. Only soils directly underneath a dead bat have been found to have *Geomyces destructans* – it can't move anywhere else in the cave and leap up and infect a bat on the wall.

Response: Wisconsin DNR participated in a broad study (Lindner et al., in press) of North American hibernaculum sediments that failed to detect the fungus in sites where WNS has not yet been observed (including Wisconsin hibernacula), but detected it in some – but not all – caves with WNS-afflicted bats. In addition, to test hypotheses related to environmental transmission and persistence, WDNR participated in a multi-agency field experiment that placed healthy Wisconsin bats in a Vermont cave in which WNS had extinguished the original colony the previous year. Most of the Wisconsin bats soon tested positive for WNS and these results show that *Geomyces destructans* can persist in cave sediment and infect healthy bats at least a year later.

Citation:

Lindner, D.L. et al. 2010. Environmental detection of *Geomyces destructans*. *Mycologia*, in press.

Decontamination

Comment: Decontamination procedures / harsh chemicals shouldn't be used in caves.

Response: WDNR decontamination protocols do not call for chemicals to be used in caves. Protocols call for dirty or contaminated gear to be removed and placed in a sealed container before it is taken from the site and/or placed in a vehicle -- immediately upon exit of the site.

Comment: The basis for the decontamination procedures is unclear.

Response: WDNR decontamination protocol outlines the best known procedures to help reduce the spread of the fungus *Geomyces destructans*, the likely causative agent for white-nose syndrome.

Comment: Why didn't the DNR just use the USFWS decontamination protocols?

Response: The WDNR decontamination protocols are based exclusively on the US Fish & Wildlife Service decontamination protocols. After the US Fish & Wildlife Service protocols were field tested by WDNR, additional measures were inserted to further address potential sources of transmission.

Comment: If bats and humans are excluded from caves, the decontamination procedures are not necessary.

Response: Since the WDNR decontamination protocol outlines the best known procedures to help reduce the spread of the fungus, all visitors to caves and/or mines must follow the control plan that was developed at each site.

Comment: Policy isn't consistent and decontamination only focuses on caves/mines. If cavers have to decontaminate, why shouldn't DOT employees working on bridges and farmers with bats in their barn? Only gear used in a cave/mine out of state is prohibited from being used in WI – what about farm equipment?

Response: Decontamination protocols follow the U.S. Fish and Wildlife Service model of addressing high transmission-risk sites such as caves and mines, and activities likely to introduce the fungus or transmit it among such sites. USFWS has not indicated that bridges or farms – or people or equipment that have been on bridges or farms – are a likely source of *Geomyces destructans* infection.

Miscellaneous

Comment: How will the DNR evaluate the effectiveness of these measures?

Response: The U.S. Fish and Wildlife Service draft plan for managing white-nose syndrome (21 Oct 2010) states that "universal precautions should be implemented to reduce incidence of disease by both preventing infections and breaking chains of transmission," and the proposed rules seek to do so. These rules are a response to an infectious disease that threatens to extinguish an entire taxon and the ecosystem services that these bats provide, and controlled experimentation in the face of this grave risk is clearly impossible. However, effectiveness can be evaluated by comparing disease dynamics: 1) among Wisconsin sites or regions whose characteristics call for variations in the way the measures are implemented, and 2) between Wisconsin and other states that are pursuing or have pursued different approaches. For example, effectiveness of surveillance and monitoring for early detection can be evaluated in terms of the degree of a Wisconsin colony's WNS infection upon initial detection versus initial degree of infection (and possibly degree of spread to nearby hibernacula) reported by other states that do not take an early detection approach as WNS enters the state and instead, wait until residents near hibernacula observe and report large numbers of dead and dying bats out on the landscape. Wisconsin also has a limited number of well-mapped and -investigated hibernacula (<120) and a plan to conduct a complete annual statewide WNS assessment. The state is therefore ideally positioned to investigate the epidemiology of the disease if and/or when it arrives, and also detect and track effects of preventive measures and management steps at all spatial scales.

Comment: How will the DNR deal with small hibernacula that could serve as foci for disease transmission to larger hibernacula?

Response: This comment refers to a WNS response strategy, rather than the three proposed rules which focus on protection, prevention, and early detection. A WNS response strategy has not yet been created, but the WDNR bat conservation program recognizes that the vast majority of Wisconsin's cave bats hibernate in a small number of large hibernacula. Indeed, much of the risk-minimization features of the proposed rules are motivated by the population-management goal of safeguarding the heart of the population by reducing transmission risk to these key sites, which are themselves already well protected by exclusions or strong and long-standing agreements with the owners of active mines. WDNR

recognizes and approaches each site as unique, and a WNS infection in a large site with > 100,000 bats would likely be addressed differently than would a site with just a few dozen individuals (i.e., < 0.01% of the population).

Comment: How will you deal with large hibernacula when WNS is found there – will you exterminate everything?

Response: This comment refers to a WNS response strategy, rather than the three proposed rules which focus on protection, prevention, and early detection. A WNS response strategy has not yet been created, but the WDNR response to such a situation would consider the unique characteristics of the site and the hibernating colony and take prudent steps to reduce infection, minimize transmission risks, and maximize survivorship.

Comment: Preventive measures should only apply to caves with bats.

Response: Prudent measures to minimize *Geomyces destructans* introduction- and transmission-risks are important even in caves and mines where bats are not generally or frequently present. Research conducted by the New York Department of Environmental Conservation and the USGS National Wildlife Health Center has demonstrated that the fungus can survive exposure to temperatures above 85°F for over two weeks, and a multi-agency study involving WDNR and partners has further demonstrated that the fungus can persist in a cool, stable cave or mine environment for at least a year. Therefore, a visitor to such a site could conceivably introduce the fungus, and the fungus could in turn persist in the site for many months. Visitors to such sites in Wisconsin can and often do visit several caves and mines as part of the same trip – often in the same day – and could track the fungus from a bat-free but *G. destructans*-infected site to another site on the circuit where bat occupancy may be more frequent or substantial. Since the WDNR decontamination protocol outlines the best known procedures to help reduce the spread of the fungus, all visitors to caves and/or mines, regardless of the number of bats found at a particular site, must follow the control plan that was developed at each site.

Comment: WI DNR is going against USFWS WNS recommendations.

Response: The U.S. Fish and Wildlife Service draft plan for managing white-nose syndrome (21 Oct 2010) states that "wildlife diseases such as WNS spread rapidly when there is high prevalence of pathogen(s), efficient chains of transmission, abundant susceptible hosts, and/or environments that allow pathogen persistence without a host. Regardless of the nature of the infectious agent (fungus, bacterium, or virus), universal precautions should be implemented to reduce incidence of disease by both preventing infections and breaking chains of transmission." The proposed rules, which include decontamination protocols that follow U.S. Fish and Wildlife guidelines, are consistent with the call to implement universal precautions to reduce infection and transmission risk.

Comment: The proposed actions will do little to slow or stop the spread of WNS.

Response: Wildlife disease-management efforts such as the proposed rules follow long-standing general epidemiological principles, which call for controlling infection (achieved through surveillance and early detection) and breaking transmission chains (via decontamination and other measures to minimize

transmission risks). The proposed rule changes have been recognized as important steps to reduce disease introduction and transmission risks and endorsed by a number of individuals and organizations actively involved in white-nose syndrome research and response, including, for example, the Midwest Bat Working Group.

Comment: Commercial caves will lose a lot of money.

Response: The WDNR recognizes that commercial cave/mine owners can play a critical role in assisting with a scientifically grounded approach to conserving Wisconsin's natural heritage and critical ecosystem services in the face of this unprecedented challenge. Control plans will be created for each site. Cost-sharing agreements will be incorporated within the control plans which will attempt to defer costs on such things as exclusion, visitor screening materials, educational materials and mailings to customers.

Comment: Recreational cavers will have to spend money to purchase more gear.

Response: Dedicated gear was purchased by the WDNR at two sites to offset the costs at these frequently visited caving locations. Unless gear has been used out of state, cavers' gear can be decontaminated and used again.

Comment: We are not allowing people to get the educational experience of bats at the commercial caves.

Response: Hibernation is a time of great vulnerability for both individual bats and populations as a whole, because each time a bat is aroused from hibernation it consumes enough stored fat reserves to support over two months' hibernation (Thomas et al. 1990). Furthermore, Thomas and colleagues note that higher mortality rates in juveniles during hibernation may be due to the fact that juveniles accumulate smaller fat reserves than adults, and presumably bats that are sick or too old to accumulate robust fat reserves are similarly vulnerable. Fortunately, commercial caves in Wisconsin report that they receive most of their visitors in the warm months of the year when bats are absent, and these businesses either close or have vastly reduced visitation in the winter. Human disturbance to hibernating colonies is thought to have been a major contributor to the long-term decline of cave-bat populations in North America (M. Tuttle, pers. comm. to D. Redell), and therefore the seasonal cessation or reduction of human activity at commercial caves is likely an important reason why bats can hibernate in these sites. Although close contact with wild animals is often a gratifying and educational opportunity for nature-lovers, the educational benefit must always be balanced against the survival needs of the animal, particularly where disease may be weakening individuals and imperiling populations.

<u>Citation:</u>

Thomas, D.W. et al. 1990. Winter energy budgets and cost of arousal for hibernating little brown bats, *Myotis lucifugus*. *Journal of Mammalogy* 71:475-479.

Comment: Why are we excluding humans? Excluding humans is pointless.

Response: Each site is unique, but in some instances – for example, a hibernaculum on private land with vandalism problems – excluding humans may be a welcome and highly effective step to protect those bats from both disease and the negative effects of disturbance during hibernation (Thomas et al. 1990). As

Turner and Reeder (2009) note, "concern over anthropogenic transmission was raised initially in 2008, after discovery that all but two or three new WNS sites found that year had been visited by either biologists or recreational users who had been in at least one of the original four sites noted [as infected] in 2007."

Citations:

Thomas, D.W. et al. 1990. Winter energy budgets and cost of arousal for hibernating little brown bats, *Myotis lucifugus*. *Journal of Mammalogy* 71:475-479.

Turner, G. and D. Reeder. 2009. Update of White Nose Syndrome in Bats, September 2009. *Bat Research News* 53:47-53.

Comment: Property owners should not be held responsible (financially) for control measures. It will cost much more to exclude bats or people than the DNR is suggesting ($100-$500). DNR should be paying for exclusion on private property.

Response: WDNR recognizes that every site and landowner is unique, but the estimated costs are based on real costs that WDNR has already paid in working with landowners or managers to apply preventive measures. Agreements with landowners typically involve cost-sharing arrangements that are acceptable to both parties.

Comment: The proposed rules will increase WNS in the state.

Response: Wildlife disease-management efforts such as the proposed rules follow long-standing general epidemiological principles, which call for controlling infection (achieved through surveillance and early detection) and breaking transmission chains (via decontamination and other measures to minimize transmission risks). The proposed rule changes have been recognized as important steps to reduce disease introduction and transmission risks and endorsed by a number of individuals and organizations actively involved in white-nose syndrome research and response, including the Midwest Bat Working Group.

Comment: Bats shouldn't be kept in refrigerators.

Response: Bats in WDNR care follow the same standards as wildlife rehabilitation facilities, including being housed in homeostatic chambers that allow them to complete their natural hibernation cycle.

Comment: DNR bat populations estimates are not accurate, partially because they focus only on large hibernacula and not the numerous smaller hibernacula.

Response: The WDNR bat conservation program has conducted a statewide investigation of every potential hibernaculum in the state, based on information received from the U.S. Geological Survey, the Natural Heritage Inventory, the Wisconsin Speleological Society, private landowners, and others. This survey began with over 800 landowners and potential sites, and through extensive surveying has now reduced the number of potential hibernacula in the state to 120 or fewer. WDNR's long-term information base includes bat-count data from over fifty of these sites, and although the several dozen sites left to investigate for the first time this year may produce a larger-than-anticipated hibernating bat population,

most new sites assessed in the current effort yield fewer than a dozen bats and no such site has changed Wisconsin's basic pattern: over 90% of the state's hibernating bats occupy a handful of the state's larger mines.

Comment: DNR will have too much authority over property rights. Requiring access by strangers to privately owned property and then requiring action on that property is quite invasive. There must be a point where the private land owner's rights are considered. Who will have liability if someone gets hurt in the cave?

Response: The principal authority for the department's invasive species rules is s. 23.22 (2) (a) and (b) 6., Stats., which requires the department to establish a statewide program to control invasive species in this state and directs the department to promulgate rules to identify, classify and control invasive species for purposes of the program, which may include procedures and requirements for issuing permits to control invasive species. In order to fulfill this broad duty, the department adopted ch. NR 40 to provide it with all of the tools that are required to control invasive species, wherever found in the state, including regulation of the possession, transportation, transfer and introduction of specific invasive species, general preventive measures designed to restrict pathways by which humans commonly spread or introduce invasive species, authority to enter property in order to inspect, survey and control invasive species, and authority to recover the state's costs when it must carry out necessary control measures because responsible parties do not comply with department orders to control invasives themselves.

Section 23.11 (1), Stats., delegates to the department such further powers as may be necessary or convenient to enable it to exercise the functions and perform the duties required of it by ch. 23, Stats., and by other provisions of law.

Invasive species have caused environmental and economic damage and threaten human health, and will continue doing so unless adequate control measures are adopted and implemented. The general legislative delegation to the department of all necessary or convenient powers set out in s. 23.11 (1), Stats., combined with the broad directive in s. 23.22 (2) (a) and (b) 6., Stats., to control invasive species in this state give the department sufficient power to adopt and revise as needed rules for the protection of public health, safety, welfare and the environment, but particularly for the promotion of public welfare, convenience and general prosperity. The department's exercise of legislatively delegated police powers, as embodied in its invasive species rules, has its basis in the inherent power and duty of government to protect and promote the life, comfort, safety and welfare of society. In addition to these rules, s. 23.22 (5m), Stats., authorizes the department to promulgate rules establishing procedures for conducting investigations and inspections necessary to carry out s. 23.22, Stats.

Under current ch. NR 40, the department may ask any person who owns, controls, or manages property where a prohibited species is present to control the prohibited species in accordance with a plan approved by the department. While a person who owns, controls, or manages property where a prohibited species is present is responsible for controlling the prohibited species that exists on the property, the department will seek funds to assist in the control of prohibited species.

Landowners would not be held liable if a DNR employee or contractor was accidentally injured while carrying out monitoring, inspection, or other kinds of fieldwork.

Comment: The rules are based on opinions, not facts; more science is needed. Experts should have been contacted. Since this originated in Europe, we should be talking with the Europeans to see what they did. The proposals should only be based on peer-reviewed literature.

Response: The comment incorrectly asserts that the proposed rules are based on opinions and were conceived without consulting experts and taking into account the relevant science. In fact, WDNR bases its approach on the best available science and plays a significant national research role in advancing our understanding of the disease. WDNR has been at the heart of the USFWS-coordinated national response to WNS from the beginning, and has attended every major national and regional WNS-related meeting since the first national WNS meeting in Albany, NY, in June 2008. Additionally, WDNR's bat ecologist is a founder and Vice President of the Midwest Bat Working Group and, as chair of the group's WNS committee, organizes and leads the Midwestern WNS response. WDNR has been working closely with world-class research programs to develop a robust understanding of *Geomyces destructans* epidemiology and ecology, and obtain critical baseline information about Wisconsin's cave bats before the fungus arrives. Examples include: 1) laboratory experiments with the USGS National Wildlife Health Research Center to establish that the disease can be transmitted bat-to-bat, 2) field experiments with a number of other agencies and research labs to establish that the disease can be transmitted cave-to-bat, 3) participation in a national rRNA gene region-based molecular study (Lindner et al., in press) to characterize the distribution of *Geomyces destructans* in North America, 4) collaboration with UW-Madison researchers on a population viability analyses for Wisconsin cave bats, and 5) collaboration with UW-Platteville researchers to create new tools to track and count bats to study foraging and migration patterns. The listing of the four cave-bat species as threatened – both because of long-term declines and the profound threat of white-nose syndrome – is consistent with conclusions by researchers that white-nose syndrome may cause regional extinctions (Frick et al. 2010), with national guidelines (Nature Serve) for evaluating species' status, and with efforts by the federal government and other states to confer legal protection on cave bats. Similarly, the listing of the fungus as a prohibited invasive species is grounded in a familiarity with the literature concerning *Geomyces destructans* in Europe (e.g., Puechmaille et al. 2010, Martínková et al. 2010, Wibbelt et al. 2010) – literature which clarifies that although the fungus is present in Europe, it does not now cause mass mortality in bats, nor have any such mass-mortality events in bats ever been recorded on the continent.

Citations:

Martínková, N. et al. 2010. Increasing Incidence of *Geomyces destructans* Fungus in Bats from the Czech Republic and Slovakia. *PLoS ONE* 5(11): e13853. doi:10.1371/journal.pone.0013853.

Puechmaille, S.J. et al. 2010. White-nose syndrome fungus (*Geomyces destructans*) in bats, France. *Emerging Infectious Diseases* 16:290–293.

Wibbelt, G. et al. 2010. Whitenose syndrome fungus (*Geomyces destructans*) in bats, Europe. *Emerging Infectious Diseases* 16: 1237–1242.

Frick, W.F. et al. 2010. An Emerging Disease Causes Regional Population Collapse of a Common North American Bat Species. *Science* 329:679-682.

Wisconsin Department of Administration
Division of Executive Budget and Finance
DOA-2048 (R10/2000)

Fiscal Estimate — 2009 Session

☒ Original	☐ Updated	LRB Number	Amendment Number if Applicable
☐ Corrected	☐ Supplemental	Bill Number	Administrative Rule Number IS-47-10 and IS-07-11 (E)

Subject

Request adoption of emergency Order IS-07-11(E) and authorization for public hearings on proposed Order IS-47-10, revision to ch. NR 40, regarding the management of white-nose syndrome in bats.

Fiscal Effect

State: ☐ No State Fiscal Effect
☒ Indeterminate

Check columns below only if bill makes a direct appropriation or affects a sum sufficient appropriation.

☐ Increase Existing Appropriation ☐ Increase Existing Revenues
☐ Decrease Existing Appropriation ☐ Decrease Existing Revenues
☐ Create New Appropriation

☒ Increase Costs — May be possible to absorb within agency's budget.
☒ Yes ☐ No

☐ Decrease Costs

Local: ☐ No Local Government Costs
☒ Indeterminate

1. ☐ Increase Costs
☐ Permissive ☐ Mandatory
2. ☐ Decrease Costs
☐ Permissive ☐ Mandatory
3. ☐ Increase Revenues
☐ Permissive ☐ Mandatory
4. ☐ Decrease Revenues
☐ Permissive ☐ Mandatory
5. Types of Local Governmental Units Affected:
☐ Towns ☐ Villages ☐ Cities
☐ Counties ☐ Others _____
☐ School Districts ☐ WTCS Districts

Fund Sources Affected

☐ GPR ☐ FED ☐ PRO ☐ PRS ☐ SEG ☐ SEG-S

Affected Chapter 20 Appropriations

Assumptions Used in Arriving at Fiscal Estimate

Rule Summary: The rule would allow specified Department actions in the unlikely event that requested voluntary cooperation is not obtained, including access (with a court warrant) to caves or mines to survey for the presence of *G. destructans,* exclusion of either bats or humans from caves or mines, and decontamination of gear used in or near caves or mines. This rule package is being proposed as both an emergency rule, IS-07-11 (E), and a permanent rule, IS-47-10.

State Fiscal Estimate:
The proposed rule package will require time by DNR staff to prepare the rule and administer rule hearings. Endangered Resources staff, as well as other Department staff, may see an increase in time associated with the changes to bat management, especially in the decontamination of equipment and in monitoring. It is assumed there will not be a significant increase in staff time, and that this time can be covered by existing appropriations.

Local Fiscal Estimate:
Minimal impact to the few local governments that own caves or mines.

Long-Range Fiscal Implications

Prepared By:	Telephone No.	Agency
Joe Polasek	266-2794	Department of Natural Resources
Authorized Signature	Telephone No.	Date (mm/dd/ccyy)
	266-2794	12-03-10

Fiscal Estimate — 2009 Session

Page 2 Assumptions Narrative Continued

LRB Number	Amendment Number if Applicable
Bill Number	Administrative Rule Number IS-47-10 and IS-07-11 (E)

Assumptions Used in Arriving at Fiscal Estimate – Continued

Wisconsin Department of Administration
Division of Executive Budget and Finance
DOA-2047 (R10/2000)

Fiscal Estimate Worksheet — 2009 Session

Detailed Estimate of Annual Fiscal Effect

☒ Original	☐ Updated	LRB Number	Amendment Number if Applicable
☐ Corrected	☐ Supplemental	Bill Number	Administrative Rule Number IS-47-10 and IS-07-11 (E)

Subject

Request adoption of emergency Order IS-07-11(E) and authorization for public hearings on proposed Order IS-47-10, revision to ch. NR 40, regarding the management of white-nose syndrome in bats.

One-time Costs or Revenue Impacts for State and/or Local Government (do not include in annualized fiscal effect):

Annualized Costs:	Annualized Fiscal Impact on State Funds from:	
A. State Costs by Category	Increased Costs	Decreased Costs
State Operations — Salaries and Fringes	$	$ -
(FTE Position Changes)	(FTE)	(- FTE)
State Operations — Other Costs		-
Local Assistance		-
Aids to Individuals or Organizations		-
Total State Costs by Category	$	$ -
B. State Costs by Source of Funds	Increased Costs	Decreased Costs
GPR	$	$ -
FED		-
PRO/PRS		-
SEG/SEG-S		-
State Revenues — Complete this only when proposal will increase or decrease state revenues (e.g., tax increase, decrease in license fee, etc.)	Increased Revenue	Decreased Revenue
GPR Taxes	$	$ -
GPR Earned		-
FED		-
PRO/PRS		-
SEG/SEG-S		-
Total State Revenues	$	$ -

Net Annualized Fiscal Impact

	State	Local
Net Change in Costs	$	$
Net Change in Revenues	$	$

Prepared By:	Telephone No.	Agency
Joe Polasek	266-2794	Department of Natural Resources
Authorized Signature	Telephone No.	Date (mm/dd/ccyy)
Joe Polasek	266-2794	12-03-10

ORDER OF THE STATE OF WISCONSIN
NATURAL RESOURCES BOARD
CREATING RULES

The Wisconsin Natural Resources Board proposes an order to create NR 40.02 (7g), (7r), (25m) and (46m), 40.04 (3m) and 40.07 (8) relating to the identification, classification and control of invasive species.

IS-47-10

Analysis Prepared by Department of Natural Resources

Statutes interpreted: Section 23.22 (2) (a), 29.924 (5) and 66.0119, Stats.

Statutory authority: Sections 23.09 (2) (intro.), 23.091, 23.11 (1), 23.22 (2) (a) and (b) and (5m), 23.28 (3), 27.01 (2) (j), 29.039 (1) and 227.11(2) (a), Stats.

Explanation of agency authority: The principal authority for the department's invasive species rules is s. 23.22 (2) (a) and (b) 6., Stats., which requires the department to establish a statewide program to control invasive species in this state and directs the department to promulgate rules to identify, classify and control invasive species for purposes of the program, which may include procedures and requirements for issuing permits to control invasive species. In order to fulfill this broad duty, the department adopted ch. NR 40 to provide it with all of the tools that are required to control invasive species, wherever found in the state, including regulation of the possession, transportation, transfer and introduction of specific invasive species, general preventive measures designed to restrict pathways by which humans commonly spread or introduce invasive species, authority to enter property in order to inspect, survey and control invasive species, and authority to recover the state's costs when it must carry out necessary control measures because responsible parties do not comply with department orders to control invasives themselves.

Section 23.11 (1), Stats., delegates to the department such further powers as may be necessary or convenient to enable it to exercise the functions and perform the duties required of it by ch. 23, Stats., and by other provisions of law.

Invasive species have caused environmental and economic damage and threaten human health, and will continue doing so unless adequate control measures are adopted and implemented. The general legislative delegation to the department of all necessary or convenient powers set out in s. 23.11 (1), Stats., combined with the broad directive in s. 23.22 (2) (a) and (b) 6., Stats., to control invasive species in this state give the department sufficient power to adopt and revise as needed rules for the protection of public health, safety, welfare and the environment, but particularly for the promotion of public welfare, convenience and general prosperity. The department's exercise of legislatively delegated police powers, as embodied in its invasive species rules, has its basis in the inherent power and duty of government to protect and promote the life, comfort, safety and welfare of society. In addition to these rules, s. 23.22 (5m), Stats., authorizes the department to promulgate rules establishing procedures for conducting investigations and inspections necessary to carry out s. 23.22, Stats.

Section 23.09 (2) (intro), Stats., grants the department general authority to adopt rules for the protection, development and use of forests, fish and game, lakes, streams, plant life, flowers and other outdoor

resources in this state. Section 23.091, Stats., authorizes the department to acquire, develop, operate and maintain state recreation areas, to establish use zones within state recreation areas providing for the full range of recreational uses, including hunting and fishing, and to promulgate rules to control uses within zones and limit the number of persons using any zone. Section 23.11 (1), Stats., gives the department the authority to have and take the general care, protection and supervision of all state parks, of all state fish hatcheries and lands used therewith, of all state forests, and of all lands owned by the state or in which it has any interests.

Section 23.28 (3), Stats., prohibits the department from allowing any use of a designated state natural area which is inconsistent with or injurious to its natural values, and authorizes the department to establish use zones, control uses within a zone and limit the number of persons using zones in designated state natural areas. Section 27.01 (2) (j), Stats., grants the department authority to promulgate rules necessary to govern the conduct of state park visitors, and for the protection of state park property, or the use of facilities, including the use of boats and other watercraft on lakes or rivers within the limits of a state park, and the use of roads, trails or bridle paths.

Section 29.039 (1), Stats., authorizes the department to develop conservation programs to ensure the perpetuation of nongame species, require harvest information and establish limitations relating to taking, possession, transportation, processing and sale or offer for sale, of nongame species. "Nongame species" is defined as any mammal, bird, fish, or other creature of a wild nature endowed with sensation and the power of voluntary motion that is living in the wild and that is not classified as a game fish, game animal, game bird or furbearing animal.

Section 227.11 (2) (a), Stats., expressly confers rulemaking authority on the department to promulgate rules interpreting any statute enforced or administered by it, if the agency considers it necessary to effectuate the purpose of the statute. The department considers the rules created by this Order to be necessary to effectuate the purposes of ss. 23.22 and s. 29.924 (5), Stats.

Related statute or rule: Related statutes or rules include but are not limited to the following provisions which, to varying degrees, may apply to the identification, classification, control or other regulation of species that are invasive, or to conduct that may result in the introduction or spread of invasive species:

Statutory section	Title [or subject]
15.347 (18)	Invasive species council.
23.093	Carp control research.
23.235	Nuisance weeds.
23.24	Aquatic plants.
26.20 (4)	[Railroad right-of-way annual weed removal]
26.30	Forest insects and diseases; department jurisdiction; procedure.
27.019 (7) (c)	[County rural planning – highways - only native plantings allowed]
27.05 (5) and (7)	[County authority to manage plants and control weeds in county waters, parks and county lands]
29.011	Title to wild animals.
29.047	Interstate transportation of game.
29.053	Specific open and closed seasons.
29.055	Wild animals; possession in closed season or in excess of bag limit.
29.057	Wild animals; possession in open season.
29.089	Hunting on land in state parks and state fish hatcheries.
29.091	Hunting or trapping in wildlife refuge.
29.192	Regulation of takings of certain wild animals.

29.301 General restrictions on hunting.
29.307 Hunting with aid of aircraft prohibited.
29.314 Shining animals.
29.327 Regulation of waterfowl blinds.
29.331 Trapping regulation.
29.334 Hunting and trapping; treatment of wild animals.
29.335 Feeding wild animals for nonhunting purposes.
29.337 Hunting and trapping by landowners and occupants.
29.354 Possession of game birds and animals.
29.407 Transportation of fish.
29.414 Erection of barriers to exclude rough fish.
29.417 Permit to take rough fish.
29.421 Removal of rough fish.
29.424 Control of detrimental fish.
29.509 Bait dealer license.
29.516 Fishing with nets and setlines.
29.601 Noxious substances.
29.604 Endangered and threatened species protected.
29.614 Scientific collector permit.
29.627 Domestic fur–bearing animal farms.
29.701 Propagation of fish; protected wild animals.
29.705 Propagation of fish; removal of fish.
29.733 Natural waters used in fish farms.
29.734 Barriers required for fish farms.
29.735 Importation of fish.
29.736 Stocking of fish.
29.737 Permit for private management.
29.738 Private fishing preserves.
29.741 Food in the wild for game birds.
29.875 Disposal of escaped deer or elk.
29.885 Removal of wild animals.
29.887 Wildlife control in urban communities.
29.924 Investigations; Searches.
29.927 Public nuisances.
29.931 Seizures.
29.934 Sale of confiscated game and objects.
30.07 Transportation of aquatic plants and animals; placement of objects in navigable waters.
30.1255 Report on control of aquatic nuisance species.
59.70 (17) and (18) [County funds, equipment, fees for pest and weed control, plant or animal diseases.]
66.0407 Noxious weeds. [local governments]
66.0517 Weed commissioner. [local governments]
66.0627 Special charges for current services. [charges for weed elimination]
84.07 (3) [DOT highway patrol officers to destroy noxious weeds on highways]
93.07 Department duties. [Dept. of Agriculture, Trade and Consumer Protection - pests]
94.01 Plant inspection and pest control authority.
94.02 Abatement of pests.
94.03 Shipment of pests and biological control agents; permits.
94.10 Nursery stock; inspection and licensing.
94.38 Agricultural and vegetable seeds; definitions.
94.41 Prohibitions. [Sale or distribution of noxious weed seed]
94.45 Powers and authority of the department.

94.46 Stop sale; penalties; enforcement.
94.69 Pesticides; rules.
94.76 Honeybee disease and pest control.
146.60 Notice of release of genetically engineered organisms into the environment.
169.04 Possession of live wild animals.
169.06 Introduction, stocking, and release of wild animals.
169.07 Exhibition of live wild animals.
169.08 Propagation of wild animals.
169.10 Sale and purchase of live wild animals.
169.11 Harmful wild animals.
169.36 Record–keeping and reporting requirements.
182.017 Transmission lines; privileges; damages. [utility weed control along transmission lines]
281.17 (2) [DNR to supervise chemical treatment of waters for the suppression of nuisance–producing organisms that are not regulated by the program established under s. 23.24 (2).]
237.10 Rapide Croche lock [Fox River lamprey barrier]

Plain language analysis: Chapter NR 40, Wis. Adm. Code, establishes a classification system for invasive species and regulates those in the prohibited and restricted categories. It also establishes preventive measures that when followed, will help minimize the spread of invasive species into or within Wisconsin. In a previous emergency rule, the department listed *Geomyces destructans* as a prohibited invasive fungus species. *Geomyces destructans* has been identified as the fungus associated with white-nose syndrome (WNS) in cave bats. Because the department has little if any control over the natural movements of bats, the main focus in WNS management is on limiting the anthropogenic spread of *G. destructans*.

This Order adds provisions to ss. NR 40.04 and 40.07 relating to early detection and prevention of the spread of WNS due to anthropogenic activities, as follows:

1. For purposes of early detection, with permission or pursuant to an inspection warrant, department staff may access caves and mines in order to monitor, survey, and inspect for the presence of *G. destructans*.
2. Equipment, gear, clothing and other objects may not be brought or placed into or near a cave or mine if they have been in or near a cave or mine located outside of Wisconsin.
3. Equipment, gear, clothing and other objects that have been in or near a cave or mine located in this state must be cleaned following department-approved protocols before they can be brought into another cave or mine in this state.
4. The cleaning process for all equipment, gear, clothing and other objects that have been in or near a cave or mine in Wisconsin must begin immediately upon exit following department-approved protocols.
5. All equipment, gear, clothing and other objects that will be or have come in contact with bats (including, but not limited to nets, traps, weighing tubes, bat bags, wing punches, rulers, clothing, gloves, electronic equipment and exclusion materials) and all individuals handling bats must be decontaminated prior to and immediately after contact.
6. Owners and operators of commercial caves and mines must ensure that their visitors comply with department-approved cleaning protocols.
7. Owners and operators of certain caves and mines must develop and implement a department-approved, site-specific plan setting out practices that they will follow for the prevention of the introduction and transmission of *G. destructans*.

The Order also adds key definitions and sets out authority for the department to grant written exemptions from the new prohibitions and cleaning requirements if the exemption will not significantly increase the risk that *G. destructans* would be introduced or transported to other locations. Conditional exemptions may be issued, and the conditions will have the force of law.

Summary of, and comparison with, existing or proposed federal regulations: None known. The US Fish and Wildlife Service has ordered the closure of federally-owned or controlled caves. It appears that this is being done via the federal government's proprietary authority as the owner or manager of federal lands where the caves or mines are located, rather than through any regulatory measures comparable to the proposed rules.

Comparison with rules in adjacent states: The department is not aware of any other states or provinces that have taken similar actions.

Summary of factual data and analytical methodologies: Bats affected with WNS were first observed in 2006 at a single cave near Albany, New York. WNS has since been found in 14 states and 2 Canadian provinces, spreading up to 800 miles in the last year. Mortality rates of affected colonies reach 100%. WNS has been linked to the death of over one-million bats since 2007 and threatens to cause the extinction of several bat species in the near future. According to a Consensus Statement issued at the WNS Emergency Science Strategy Meeting in May 2009, white-nose syndrome "... has caused the most precipitous decline of North American wildlife in recorded history." Last spring, the disease was detected within 225 miles of Wisconsin's southern border and 300 miles from the northern border. That means a WNS-infected cave is now located within the 280-mile dispersal range of Wisconsin little brown bats. Based on the disease's current location and known rate of spread, we anticipate the detection of WNS in Wisconsin as early as January, 2011.

Hibernating bats are susceptible to WNS. Those infected tend to show a white fungal growth on their face, arms, legs, wings, and/or tail caused by the newly isolated and named fungus, *Geomyces destructans*. Infected bats exhibit atypical behavior such as daytime activity during winter hibernation, which rapidly depletes stored energy reserves. Wing damage and emaciation are also common.

To date, nine species of cave bats are affected by WNS, including the federally endangered Indiana bat, which historically was found in Wisconsin. All Wisconsin cave bats, which include the little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*), are among the species fatally affected by WNS. Consequently, Wisconsin's cave bat population as a whole is threatened by this devastating disease. The little brown bat is Wisconsin's most common bat species and because this species has seen the greatest mortality rate due to WNS, Wisconsin anticipates significant impacts to its cave bat populations when WNS begins to affect Wisconsin bats. Research published in the journal *Science* (August 2010) states "...we expect a 99% chance of regional extinction of little brown myotis within the next 16 years."

Research conducted at the United States Geological Survey (USGS) Wildlife Health Center has shown that *G. destructans* is transferred from bat to bat, and a multi-agency project demonstrated bats can develop white-nose syndrome (WNS) through infection directly from an affected cave environment, in the absence of infected bats.

There is also evidence of human transfer of *G. destructans* from site to site and/or bat via contaminated equipment, gear or clothing. There have been long-distance jumps in the spread of WNS, beyond the distance bats would likely transmit the disease. These "jump" sites have been frequently-visited caves,

often with small bat populations. The U.S. Geological Survey, National Wildlife Health Center has detected *G. destructans* fungal spores in cave sediment, demonstrating persistence of the fungus in the absence of bats. The New York Department of Environmental Conservation, Wildlife Pathology Unit has isolated *G. destructans* fungal spores on equipment and clothing after exiting an affected cave.

Even in the face of incomplete information, general epidemiological principles should be used to inform the WNS investigation and response. All available evidence indicates that WNS is caused by an infectious agent and can therefore potentially be spread by all known modes of disease transmission, including direct contact, inhalation, ingestion, fomites (inanimate objects), and human or animal vectors. Wildlife diseases such as WNS spread rapidly when there is high prevalence of pathogen(s), efficient chains of transmission, abundant susceptible hosts, and/or environments that allow pathogen persistence without a host. Regardless of the infectious agent (fungus, bacterium, or virus), universal precautions should be implemented. Universal precautions are procedures and guidelines designed to reduce incidence of disease by both preventing infections and breaking chains of transmission.

These rules were developed with the assistance of the Bureaus of Endangered Resources and Legal Services. Department of Justice opinion was also sought and confirmed the need to put the proposed actions into rule. The department has also recently met with stakeholders, including mine and commercial cave owners to discuss WNS and possible management options. All known cave and mine owners in Wisconsin were contacted this year as well to provide background information on WNS and cave management.

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact report: None.

Effect on small business, including how the rule will be enforced: The rule is not expected to have a significant adverse effect on a substantial number of small businesses. Therefore, under s. 227.19 (3m), Stats., a final regulatory flexibility analysis is not required. The rule may have favorable effects on a number of businesses by preventing the introduction or limiting the spread of WNS, thereby preserving the agricultural, economic and environmental benefits associated with healthy bat populations.

There are approximately 120 known bat hibernacula in Wisconsin, and approximately 12 of these are public caves. In addition, less than 20 of the caves and mines in Wisconsin are routinely caved. Affected constituencies include commercial caves and mines, active underground mines, private cave and mine owners, recreational cavers, agriculture and forest industries, and conservation organizations. Concerns will likely include how the proposed rules will affect current activities. Many of these potential concerns may be addressed through cost-sharing, technical support, and education provided by the department. Examples include: cost-sharing for installation of bat-friendly gates or other physical barriers, cost-sharing for conservation actions, providing cave closure signage and cleaning protocols, and providing locations of caves that may be used for recreational caving activities (where bats are known to have been excluded). Agriculture industries, forest industries and conservation organizations would be negatively affected by not attempting to control or slow the spread of WNS.

The cost of cleaning equipment, gear, clothing and other objects will be minimal. The cost of caving gear typically ranges from $125-$750. Very few sites in Wisconsin require vertical climbing gear. The cost of commercially cleaning gear according to department protocols typically ranges from $10 to $12 per set of gear. The cost of signage at caves and mines would be $0 because the department will provide the signs.

Under current ch. NR 40, the department may ask any person who owns, controls, or manages property where a prohibited species is present to control the prohibited species in accordance with a plan approved by the department. While a person who owns, controls, or manages property where a prohibited species is

present is responsible for controlling the prohibited species that exists on the property, the department will seek funds to assist in the control of prohibited species.

The department will normally follow an informal, stepped enforcement process in order to obtain compliance with invasive species rules. This involves informal discussions between department staff and the individual, landowner or company, notifying the person of potential violations and providing guidance on how to comply with the rules. Notices of non-compliance may follow if necessary. If formal enforcement is necessary, ch. NR 40 will be enforced by department conservation wardens, county district attorneys, and circuit courts through the use of citations and civil or criminal complaints. Civil and criminal enforcement may also be carried out by department referral of violations to the Wisconsin Attorney General, with prosecution and abatement actions in the circuit courts. Criminal enforcement will be limited to intentional violations. Finally, violations of the permits issued under ch. NR 40 also may be enforced by administrative permit revocation proceedings.

Under s. 227.19 (3m), Stats., a final regulatory flexibility analysis is not required.

Agency contact person: Erin Crain – ER/6, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921. (608) 267-7479, email: erin.crain@wisconsin.gov.

SECTION 1. NR 40.02 (7g), (7r), (25m) and (46m) are created to read:

NR 40.02 (7g) "Cave" means any naturally occurring void, cavity, recess or system of interconnected passageways beneath the surface of the earth or in a bluff, cliff or ledge, including pits and sinkholes, but does not include a rock shelter.

(7r) "Commercial cave or mine" means a cave or mine that has more than 1,000 visitors per year and charges a fee.

(25m) "Mine" means any artificial excavation, shaft, underground passageway, slope, tunnel or working from which ore or mineral is or was extracted, but does not include an open pit mine. However, caves or mines may be located adjacent to open pit mines.

(46m) "Rock shelter" means an overhang or cave-like opening in a bluff, cliff or ledge that is shallow and does not provide an area of substantial daytime darkness.

SECTION 2. NR 40.04 (3m) is created to read:

NR 40.04 (3m) EARLY DETECTION MONITORING. Unless entry is otherwise authorized by law, as part of an invasive species early detection program, the department or its designee may enter property where a cave or mine may be located to monitor, survey or inspect for the presence of the prohibited invasive fungus species *Geomyces destructans* (white-nose syndrome fungal pathogen) in the cave or mine, with permission of the person who owns, controls or manages the property, but if the

person does not grant permission or cannot be located by the department after making reasonable effort, the department may seek an inspection warrant under s. 66.0119, Stats., from the appropriate circuit court authorizing entry. Data obtained by the department under this subsection shall be made available to the person who owns, controls or manages the property.

SECTION 3. NR 40.07 (8) is created to read:

NR 40.07 (8) WHITE-NOSE SYNDROME PREVENTION. (a) *Definition.* In this subsection "near a cave or mine" means within 100 feet of a cave or mine.

(b) *Entry with imported items prohibited.* Except as provided in par. (e), no person may bring or place any equipment, gear, clothing or other object of any kind in or near a cave or mine if the equipment, gear, clothing or other object has been in or near a cave or mine located outside of Wisconsin.

(c) *Requirements.* 1. Except as provided in subd. 5. and par. (e), no person may bring or place any equipment, gear, clothing or other object of any kind in or near a cave or mine if the equipment, gear, clothing or other object has been in or near a cave or mine located in this state unless the equipment, gear, clothing or other object has first been cleaned in accordance with par. (d).

2. Except as provided in subd. 5. and par. (e), any person removing any equipment, gear, clothing or other object of any kind from any cave or mine or from within 100 feet of any cave or mine or exiting any cave or mine or the area within 100 feet of any cave or mine with any equipment, gear, clothing or other object of any kind shall clean the equipment, gear, clothing and other objects in accordance with par. (d).

3. Except as provided in subd. 5. and par. (e), any person who caused or will cause contact to occur between a bat and an individual or object of any kind, including but not limited to a net, trap, weighting tube, bat bag, wing punch, ruler, clothing, glove, electronic equipment or exclusion material shall, prior to and immediately following the contact, clean the individual or object in accordance with par. (d).

4. Except as provided in subd. 5. and par. (e), any person who owns or operates a commercial cave or mine shall ensure that each visitor to the person's commercial cave or mine complies with par. (b) and subds. 1. to 3.

5. The requirements of subds. 1. to 4. do not apply to dedicated equipment, gear, clothing and other objects of any kind that are used exclusively in or near and stored exclusively in or near a single cave or mine.

(d) *Protocols.* Individuals, equipment, gear, clothing and other objects of any kind to which the requirement of par. (c) 1., 2., or 3. applies shall be cleaned in accordance with protocols approved by the department.

Note: Detailed information about department-approved cleaning protocols may be obtained at http://dnr.wi.gov/org/land/er/bats/ or by writing to Wisconsin Department of Natural Resources, Wisconsin Bat Monitoring Program, Bureau of Endangered Resources, P.O. Box 7921, Madison, WI 53707-7921.

(e) *Written exemption.* The department may exempt any person in writing from par. (b) or (c) if it determines that the exemption will not significantly increase the risk that *Geomyces destructans* (white-nose syndrome fungal pathogen) would be introduced or transported to other locations. The department may set conditions in any written exemption granted under this paragraph. Any person who receives a conditional exemption from the department under this paragraph shall comply with the conditions of the exemption.

(f) *Site-specific prevention plan.* Except as provided in subd. 5., any person who owns or operates a cave or mine shall develop a written plan for each of the person's caves and mines to prevent the introduction and transmission of *Geomyces destructans* (white-nose syndrome fungal pathogen).

1. The prevention plan shall include a description of practices that will be installed or implemented by the owner or operator to prevent the introduction or transmission of *Geomyces destructans* via human transmission. The plan may include practices such as screening visitors, cleaning equipment, gear, clothing and other objects before they are brought into the cave or mine or upon their removal, the use of dedicated equipment, gear, clothing and other objects, and modification of the cave or mine environment to make it unsuitable for establishment and transmission of *Geomyces destructans*.

2. The prevention plan shall be submitted by the owner or operator to the department by the effective date of this subsection . . . . [legislative reference bureau inserts date] for its review and approval. The department may set conditions for the approval of any plan required under this paragraph. In setting conditions for the approval of any plan, the department shall consider the site-specific risk of *Geomyces destructans* introduction and transmission along with the feasibility and reasonableness of alternative practices for the prevention of *Geomyces destructans* transmission or introduction.

3. The owner or operator shall implement the plan as approved by the department and shall maintain as appropriate all practices specified in the plan.

4. The owner or operator shall maintain a copy of the approved prevention plan at the cave or mine covered by the plan or an alternate location approved by the department and shall make the copy available for inspection upon request by the department at any reasonable time.

5. This paragraph does not apply to any of the following:

a. A cave or mine that the department has determined in writing lacks the environmental conditions, including temperature and humidity, suitable for the introduction or transmission of *Geomyces destructans*.

b. A cave or mine where the owner or operator restricts human access through the use of department-supplied and maintained signage or bat-friendly barriers or gates.

c. A cave or mine where the primary reason for human presence in the cave or mine relates to the storage or processing of a food or beverage intended for human consumption.

SECTION 4. **EFFECTIVE DATE.** The rule contained herein shall take effect on the first day of the month following publication in the Wisconsin administrative register, as provided in s. 227.22 (2) (intro.), Stats.

SECTION 5. **BOARD ADOPTION.** The foregoing rule was approved and adopted by the State of Wisconsin Natural Resources Board on _____.

Dated at Madison, Wisconsin _____.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By _____
Matthew J. Frank, Secretary

(SEAL)

ORDER OF THE STATE OF WISCONSIN
NATURAL RESOURCES BOARD
REPEALING, AMENDING AND REPEALING AND RECREATING RULES

The Wisconsin Natural Resources Board proposes an emergency order to repeal NR 40.02 (28m); to amend NR 40.04 (3m), and to repeal and recreate NR 40.07 (8), (all as created by Natural Resource Board emergency order IS-49-10(E)), relating to the identification, classification and control of invasive species

IS-07-11(E)

Analysis Prepared by Department of Natural Resources

Statutes interpreted: Section 23.22 (2) (a) and 29.924 (5), Stats.

Statutory authority: Sections 23.09 (2) (intro.), 23.091, 23.11 (1), 23.22 (2) (a) and (b), (2t) (a) and (5m), 23.28 (3), 27.01 (2) (j), 29.039 (1), 227.11 (2) (a) and 227.24 (1) (a), Stats.

Explanation of agency authority: The principal authority for the department's invasive species rules is s. 23.22 (2) (a) and (b) 6., Stats., which requires the department to establish a statewide program to control invasive species in this state and directs the department to promulgate rules to identify, classify and control invasive species for purposes of the program, which may include procedures and requirements for issuing permits to control invasive species. In order to fulfill this broad duty, the department adopted ch. NR 40 to provide it with all of the tools that are required to control invasive species, wherever found in the state, including regulation of the possession, transportation, transfer and introduction of specific invasive species, general preventive measures designed to restrict pathways by which humans commonly spread or introduce invasive species, authority to enter property in order to inspect, survey and control invasive species, and authority to recover the state's costs when it must carry out necessary control measures because responsible parties do not comply with department orders to control invasives themselves.

Section 23.11 (1), Stats., delegates to the department such further powers as may be necessary or convenient to enable it to exercise the functions and perform the duties required of it by ch. 23, Stats., and by other provisions of law.

Invasive species have caused environmental and economic damage and threaten human health, and will continue doing so unless adequate control measures are adopted and implemented. The general legislative delegation to the department of all necessary or convenient powers set out in s. 23.11 (1), Stats., combined with the broad directive in s. 23.22 (2) (a) and (b) 6., Stats., to control invasive species in this state give the department sufficient power to adopt and revise as needed rules for the protection of public health, safety, welfare and the environment, but particularly for the promotion of public welfare, convenience and general prosperity. The department's exercise of legislatively delegated police powers, as embodied in its invasive species rules, has its basis in the inherent power and duty of government to protect and promote the life, comfort, safety and welfare of society. In addition to these rules, s. 23.22 (5m), Stats., authorizes the department to promulgate rules establishing procedures for conducting investigations and inspections necessary to carry out s. 23.22, Stats.

Section 23.09 (2) (intro), Stats., grants the department general authority to adopt rules for the protection, development and use of forests, fish and game, lakes, streams, plant life, flowers and other outdoor resources in this state. Section 23.091, Stats., authorizes the department to acquire, develop, operate and

maintain state recreation areas, to establish use zones within state recreation areas providing for the full range of recreational uses, including hunting and fishing, and to promulgate rules to control uses within zones and limit the number of persons using any zone. Section 23.11 (1), Stats., gives the department the authority to have and take the general care, protection and supervision of all state parks, of all state fish hatcheries and lands used therewith, of all state forests, and of all lands owned by the state or in which it has any interests.

Section 23.28 (3), Stats., prohibits the department from allowing any use of a designated state natural area which is inconsistent with or injurious to its natural values, and authorizes the department to establish use zones, control uses within a zone and limit the number of persons using zones in designated state natural areas. Section 27.01 (2) (j), Stats., grants the department authority to promulgate rules necessary to govern the conduct of state park visitors, and for the protection of state park property, or the use of facilities, including the use of boats and other watercraft on lakes or rivers within the limits of a state park, and the use of roads, trails or bridle paths.

Section 29.039 (1), Stats., authorizes the department to develop conservation programs to ensure the perpetuation of nongame species, require harvest information and establish limitations relating to taking, possession, transportation, processing and sale or offer for sale, of nongame species. "Nongame species" is defined as any mammal, bird, fish, or other creature of a wild nature endowed with sensation and the power of voluntary motion that is living in the wild and that is not classified as a game fish, game animal, game bird or furbearing animal.

Section 227.11 (2) (a), Stats., expressly confers rulemaking authority on the department to promulgate rules interpreting any statute enforced or administered by it, if the agency considers it necessary to effectuate the purpose of the statute. The department considers the rules created by this Order to be necessary to effectuate the purposes of s. 23.22, Stats.

Section 227.24 (1) (a), Stats., authorizes state agencies to promulgate a rule as an emergency rule without complying with the notice, hearing and publication requirements under ch. 227, Stats., if preservation of the public peace, health, safety or welfare necessitates putting the rule into effect prior to the time it would take effect if the agency complied with the procedures. However, s. 23.22 (2t) (a), Stats., authorizes the department to promulgate emergency rules to identify, classify, or control an invasive species without having to provide evidence that an emergency rule is necessary for the preservation of public peace, health, safety, or welfare or to provide a finding of emergency. In addition, such emergency rules may remain in effect until whichever of the following occurs first: the first day of the 25th month beginning after the effective date of the emergency rule, the effective date of the repeal of the emergency rule, or the date on which the permanent rule identifying, classifying, or controlling the invasive species, promulgated under s. 23.22 (2) (b) 6., Stats., takes effect.

Related statute or rule: Related statutes or rules include but are not limited to the following provisions which, to varying degrees, may apply to the identification, classification, control or other regulation of species that are invasive, or to conduct that may result in the introduction or spread of invasive species:

Statutory section	Title [or subject]
15.347 (18)	Invasive species council.
23.093	Carp control research.
23.235	Nuisance weeds.
23.24	Aquatic plants.
26.20 (4)	[Railroad right-of-way annual weed removal]
26.30	Forest insects and diseases; department jurisdiction; procedure.

27.019 (7) (c) [County rural planning – highways - only native plantings allowed]
27.05 (5) and (7) [County authority to manage plants and control weeds in county waters, parks and county lands]
29.011 Title to wild animals.
29.047 Interstate transportation of game.
29.053 Specific open and closed seasons.
29.055 Wild animals; possession in closed season or in excess of bag limit.
29.057 Wild animals; possession in open season.
29.089 Hunting on land in state parks and state fish hatcheries.
29.091 Hunting or trapping in wildlife refuge.
29.192 Regulation of takings of certain wild animals.
29.301 General restrictions on hunting.
29.307 Hunting with aid of aircraft prohibited.
29.314 Shining animals.
29.327 Regulation of waterfowl blinds.
29.331 Trapping regulation.
29.334 Hunting and trapping; treatment of wild animals.
29.335 Feeding wild animals for nonhunting purposes.
29.337 Hunting and trapping by landowners and occupants.
29.354 Possession of game birds and animals.
29.407 Transportation of fish.
29.414 Erection of barriers to exclude rough fish.
29.417 Permit to take rough fish.
29.421 Removal of rough fish.
29.424 Control of detrimental fish.
29.509 Bait dealer license.
29.516 Fishing with nets and setlines.
29.601 Noxious substances.
29.604 Endangered and threatened species protected.
29.614 Scientific collector permit.
29.627 Domestic fur–bearing animal farms.
29.701 Propagation of fish; protected wild animals.
29.705 Propagation of fish; removal of fish.
29.733 Natural waters used in fish farms.
29.734 Barriers required for fish farms.
29.735 Importation of fish.
29.736 Stocking of fish.
29.737 Permit for private management.
29.738 Private fishing preserves.
29.741 Food in the wild for game birds.
29.875 Disposal of escaped deer or elk.
29.885 Removal of wild animals.
29.887 Wildlife control in urban communities.
29.924 Investigations; Searches.
29.927 Public nuisances.
29.931 Seizures.
29.934 Sale of confiscated game and objects.
30.07 Transportation of aquatic plants and animals; placement of objects in navigable waters.
30.1255 Report on control of aquatic nuisance species.
59.70 (17) and (18) [County funds, equipment, fees for pest and weed control, plant or animal diseases.]
66.0407 Noxious weeds. [local governments]

66.0517 Weed commissioner. [local governments]
66.0627 Special charges for current services. [charges for weed elimination]
84.07 (3) [DOT highway patrol officers to destroy noxious weeds on highways]
93.07 Department duties. [Dept. of Agriculture, Trade and Consumer Protection - pests]
94.01 Plant inspection and pest control authority.
94.02 Abatement of pests.
94.03 Shipment of pests and biological control agents; permits.
94.10 Nursery stock; inspection and licensing.
94.38 Agricultural and vegetable seeds; definitions.
94.41 Prohibitions. [Sale or distribution of noxious weed seed]
94.45 Powers and authority of the department.
94.46 Stop sale; penalties; enforcement.
94.69 Pesticides; rules.
94.76 Honeybee disease and pest control.
146.60 Notice of release of genetically engineered organisms into the environment.
169.04 Possession of live wild animals.
169.06 Introduction, stocking, and release of wild animals.
169.07 Exhibition of live wild animals.
169.08 Propagation of wild animals.
169.10 Sale and purchase of live wild animals.
169.11 Harmful wild animals.
169.36 Record–keeping and reporting requirements.
182.017 Transmission lines; privileges; damages. [utility weed control along transmission lines]
281.17 (2) [DNR to supervise chemical treatment of waters for the suppression of nuisance–producing organisms that are not regulated by the program established under s. 23.24 (2).]
237.10 Rapide Croche lock [Fox River lamprey barrier]

Plain language analysis: Chapter NR 40, Wis. Adm. Code, establishes a classification system for invasive species and regulates those in the prohibited and restricted categories. It also establishes preventive measures that when followed, will help minimize the spread of invasive species into or within Wisconsin. In a previous emergency rule the department added *Geomyces destructans*, the fungus associated with white-nose syndrome in cave bats, to the list of prohibited invasive species set out in s. NR 40.04, Wis. Adm. Code.

In a second emergency rule (IS-49-10(E)) effective Nov. 3, 2010, the department created provisions in ss. NR 40.04 and 40.07 relating to the early detection and prevention of the spread of white-nose syndrome due to human activities. Meanwhile, public hearings were held in October and November, 2010 on an identical proposed permanent rule, IS-47-10. Based on the comments received from the public and the Rules Clearinghouse and the department's continuing review, significant revisions have been made to the proposed permanent rule and it is now necessary to conform the emergency rules created by IS-49-10(E) to conform them to the revised, proposed permanent rule.

SECTION 1. of this order repeals a definition that has been recreated in another section of the chapter, as recommended by the Rules Clearinghouse.

SECTION 2. of this order amends the common name used to describe *G. destructans*, in response to a recommendation by the Rules Clearinghouse.

SECTION 3. of this order repeals and recreates a subsection in NR 40.07 created by IS-49-10(E). It contained a series of decontamination requirements and a procedures by which the department could order owners and operators of caves and mines to exclude either people or bats. The recreated subsection contains similar requirements for the cleaning of equipment, gear and other objects, and specifies that owners and operators of commercial caves and mines must ensure that their visitors comply with

department-approved cleaning protocols. However, the recreated subsection replaces the administrative order procedures with a prevention plan requirement. Owners and operators of certain caves and mines must develop and implement department-approved, site-specific plans detailing the practices that they will use to prevent the introduction and transmission of *G. destructans*.

Summary of, and comparison with, existing or proposed federal regulations: None known. The US Fish and Wildlife Service has ordered the closure of federally-owned or controlled caves. It appears that this is being done via the federal government's proprietary authority as the owner or manager of federal lands where the caves or mines are located, rather than through any regulatory measures comparable to the proposed rules.

Comparison with rules in adjacent states: The department is not aware of any other states or provinces that have taken similar actions.

Summary of factual data and analytical methodologies: Bats affected with WNS were first observed in 2006 at a single cave near Albany, New York. WNS has since been found in 14 states and 2 Canadian provinces, spreading up to 800 miles in the last year. Mortality rates of affected colonies reach 100%. WNS has been linked to the death of over one-million bats since 2007 and threatens to cause the extinction of several bat species in the near future. According to a Consensus Statement issued at the WNS Emergency Science Strategy Meeting in May 2009, white-nose syndrome "... has caused the most precipitous decline of North American wildlife in recorded history." Last spring, the disease was detected within 225 miles of Wisconsin's southern border and 300 miles from the northern border. That means a WNS-infected cave is now located within the 280-mile dispersal range of Wisconsin little brown bats. Based on the disease's current location and known rate of spread, we anticipate the detection of WNS in Wisconsin as early as January, 2011.

Hibernating bats are susceptible to WNS. Those infected tend to show a white fungal growth on their face, arms, legs, wings, and/or tail caused by the newly isolated and named fungus, *Geomyces destructans*. Infected bats exhibit atypical behavior such as daytime activity during winter hibernation, which rapidly depletes stored energy reserves. Wing damage and emaciation are also common.

To date, nine species of cave bats are affected by WNS, including the federally endangered Indiana bat, which historically was found in Wisconsin. All Wisconsin cave bats, which include the little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*), are among the species fatally affected by WNS. Consequently, Wisconsin's cave bat population as a whole is threatened by this devastating disease. The little brown bat is Wisconsin's most common bat species and because this species has seen the greatest mortality rate due to WNS, Wisconsin anticipates significant impacts to its cave bat populations when WNS begins to affect Wisconsin bats. Research published in the journal *Science* (August 2010) states "...we expect a 99% chance of regional extinction of little brown myotis within the next 16 years."

Research conducted at the United States Geological Survey (USGS) Wildlife Health Center has shown that *G. destructans* is transferred from bat to bat, and a multi-agency project demonstrated bats can develop white nose syndrome (WNS) through infection directly from an affected cave environment, in the absence of infected bats.

There is also evidence of human transfer of *G. destructans* from site to site and/or bat via contaminated equipment, gear or clothing. There have been long-distance jumps in the spread of WNS, beyond the distance bats would likely transmit the disease. These "jump" sites have been frequently-visited caves, often with small bat populations. The U.S. Geological Survey, National Wildlife Health Center has detected *G. destructans* fungal spores in cave sediment, demonstrating persistence of the fungus in the

absence of bats. The New York Department of Environmental Conservation, Wildlife Pathology Unit has isolated *G. destructans* fungal spores on equipment and clothing after exiting an affected cave.

Even in the face of incomplete information, general epidemiological principles should be used to inform the WNS investigation and response. All available evidence indicates that WNS is caused by an infectious agent and can therefore potentially be spread by all known modes of disease transmission, including direct contact, inhalation, ingestion, fomites (inanimate objects), and human or animal vectors. Wildlife diseases such as WNS spread rapidly when there is high prevalence of pathogen(s), efficient chains of transmission, abundant susceptible hosts, and/or environments that allow pathogen persistence without a host. Regardless of the infectious agent (fungus, bacterium, or virus), universal precautions should be implemented. Universal precautions are procedures and guidelines designed to reduce incidence of disease by both preventing infections and breaking chains of transmission.

These rules were developed with the assistance of the Bureaus of Endangered Resources and Legal Services. Department of Justice opinion was also sought and confirmed the need to put the proposed actions into rule. The department has also recently met with stakeholders, including mine and commercial cave owners to discuss WNS and possible management options. All known cave and mine owners in Wisconsin were contacted this year as well to provide background information on WNS and cave management.

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact report: None.

Effect on small business, including how the rule will be enforced: The rule is not expected to have a significant adverse effect on a substantial number of small businesses. Therefore, under s. 227.19 (3m), Stats., a final regulatory flexibility analysis is not required. The rule may have favorable effects on a number of businesses by preventing the introduction or limiting the spread of WNS, thereby preserving the agricultural, economic and environmental benefits associated with healthy bat populations.

There are approximately 120 known bat hibernacula in Wisconsin, and approximately 12 of these are public caves. In addition, less than 20 of the caves and mines in Wisconsin are routinely caved. Affected constituencies include commercial caves and mines, active underground mines, private cave and mine owners, recreational cavers, agriculture and forest industries, and conservation organizations. Concerns will likely include how the proposed rules will affect current activities. Many of these potential concerns may be addressed through cost-sharing, technical support, and education provided by the department. Examples include: cost-sharing for installation of bat-friendly gates or other physical barriers, cost-sharing for conservation actions, providing cave closure signage and cleaning protocols, and providing locations of caves that may be used for recreational caving activities (where bats are known to have been excluded). Agriculture industries, forest industries and conservation organizations would be negatively affected by not attempting to control or slow the spread of WNS.

The cost of cleaning equipment, gear, clothing and other objects will be minimal. The cost of caving gear typically ranges from $125-$750. Very few sites in Wisconsin require vertical climbing gear. The cost of commercially cleaning gear according to department protocols typically ranges from $10 to $12 per set of gear. The cost of signage at caves and mines would be $0 because the department will provide the signs.

Under current ch. NR 40, the department may ask any person who owns, controls, or manages property where a prohibited species is present to control the prohibited species in accordance with a plan approved by the department. While a person who owns, controls, or manages property where a prohibited species is present is responsible for controlling the prohibited species that exists on the property, the department will seek funds to assist in the control of prohibited species.

The department will normally follow an informal, stepped enforcement process in order to obtain compliance with invasive species rules. This involves informal discussions between department staff and the individual, landowner or company, notifying the person of potential violations and providing guidance on how to comply with the rules. Notices of non-compliance may follow if necessary. If formal enforcement is necessary, ch. NR 40 will be enforced by department conservation wardens, county district attorneys, and circuit courts through the use of citations and civil or criminal complaints. Civil and criminal enforcement may also be carried out by department referral of violations to the Wisconsin Attorney General, with prosecution and abatement actions in the circuit courts. Criminal enforcement will be limited to intentional violations. Finally, violations of the permits issued under ch. NR 40 also may be enforced by administrative permit revocation proceedings.

Under s. 227.19 (3m), Stats., a final regulatory flexibility analysis is not required.

Agency contact person: Erin Crain, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921. (608) 267-7479, email: erin.crain@wisconsin.gov.

SECTION 1. NR 40.02 (28m), as created by Natural Resource Board order IS-49-10(E), is repealed.

SECTION 2. NR 40.04 (3m), as created by Natural Resource Board order IS-49-10(E), is amended to read:

NR 40.04 (3m) EARLY DETECTION MONITORING. Unless entry is otherwise authorized by law, as part of an invasive species early detection program, the department or its designee may enter property where a cave or mine may be located to monitor, survey or inspect for the presence of the prohibited invasive fungus species *Geomyces destructans* (~~white nose~~ white-nose syndrome fungal pathogen) in the cave or mine, with permission of the person who owns, controls or manages the property, but if the person does not grant permission or cannot be located by the department after making reasonable effort, the department may seek an inspection warrant from the appropriate circuit court authorizing entry. Data obtained by the department under this subsection shall be made available to the person who owns, controls or manages the property.

SECTION 3. NR 40.07 (8), as created by Natural Resource Board order IS-49-10(E), is repealed and recreated to read:

NR 40.07 (8) WHITE-NOSE SYNDROME PREVENTION. (a) *Definition.* In this subsection "near a cave or mine" means within 100 feet of a cave or mine.

(b) *Entry with imported items prohibited.* Except as provided in par. (e), no person may bring or place any equipment, gear, clothing or other object of any kind in or near a cave or mine if the equipment, gear, clothing or other object has been in or near a cave or mine located outside of Wisconsin.

(c) *Requirements.* 1. Except as provided in subd. 5. and par. (e), no person may bring or place any equipment, gear, clothing or other object of any kind in or near a cave or mine if the equipment, gear, clothing or other object has been in or near a cave or mine located in this state unless the equipment, gear, clothing or other object has first been cleaned in accordance with par. (d).

2. Except as provided in subd. 5. and par. (e), any person removing any equipment, gear, clothing or other object of any kind from any cave or mine or from within 100 feet of any cave or mine or exiting any cave or mine or the area within 100 feet of any cave or mine with any equipment, gear, clothing or other object of any kind shall clean the equipment, gear, clothing and other objects in accordance with par. (d).

3. Except as provided in subd. 5. and par. (e), any person who caused or will cause contact to occur between a bat and an individual or object of any kind, including but not limited to a net, trap, weighting tube, bat bag, wing punch, ruler, clothing, glove, electronic equipment or exclusion material shall, prior to and immediately following the contact, clean the individual or object in accordance with par. (d).

4. Except as provided in subd. 5. and par. (e), any person who owns or operates a commercial cave or mine shall ensure that each visitor to the person's commercial cave or mine complies with par. (b) and subds. 1. to 3.

5. The requirements of subds. 1. to 4. do not apply to dedicated equipment, gear, clothing and other objects of any kind that are used exclusively in or near and stored exclusively in or near a single cave or mine.

(d) *Protocols.* Individuals, equipment, gear, clothing and other objects of any kind to which the requirement of par. (c) 1., 2., or 3. applies shall be cleaned in accordance with protocols approved by the department.

Note: Detailed information about department-approved cleaning protocols may be obtained at http://dnr.wi.gov/org/land/er/bats/ or by writing to Wisconsin Department of Natural Resources, Wisconsin Bat Monitoring Program, Bureau of Endangered Resources, P.O. Box 7921, Madison, WI 53707-7921.

(e) *Written exemption.* The department may exempt any person in writing from par. (b) or (c) if it determines that the exemption will not significantly increase the risk that *Geomyces destructans* (white-nose syndrome fungal pathogen) would be introduced or transported to other locations. The department may set conditions in any written exemption granted under this paragraph. Any person who receives a

conditional exemption from the department under this paragraph shall comply with the conditions of the exemption.

(f) *Site-specific prevention plan.* Except as provided in subd. 5., any person who owns or operates a cave or mine shall develop a written plan for each of the person's caves and mines to prevent the introduction and transmission of *Geomyces destructans* (white-nose syndrome fungal pathogen).

1. The prevention plan shall include a description of practices that will be installed or implemented by the owner or operator to prevent the introduction or transmission of *Geomyces destructans* via human transmission. The plan may include practices such as screening visitors, cleaning equipment, gear, clothing and other objects before they are brought into the cave or mine or upon their removal, the use of dedicated equipment, gear, clothing and other objects, and modification of the cave or mine environment to make it unsuitable for establishment and transmission of *Geomyces destructans*.

2. The prevention plan shall be submitted by the owner or operator to the department by March 1, 2011 for its review and approval. The department may set conditions for the approval of any plan required under this paragraph. In setting conditions for the approval of any plan, the department shall consider the site-specific risk of *Geomyces destructans* introduction and transmission along with the feasibility and reasonableness of alternative practices for the prevention of *Geomyces destructans* transmission or introduction.

3. The owner or operator shall implement the plan as approved by the department and shall maintain as appropriate all practices specified in the plan.

4. The owner or operator shall maintain a copy of the approved prevention plan at the cave or mine covered by the plan or an alternate location approved by the department and shall make the copy available for inspection upon request by the department at any reasonable time.

5. This paragraph does not apply to any of the following:

a. A cave or mine that the department has determined in writing lacks the environmental conditions, including temperature and humidity, suitable for the introduction or transmission of *Geomyces destructans*.

b. A cave or mine where the owner or operator restricts human access through the use of department-supplied and maintained signage or bat-friendly barriers or gates.

c. A cave or mine where the primary reason for human presence in the cave or mine relates to the storage or processing of a food or beverage intended for human consumption.

SECTION 4. **EFFECTIVE DATE.** This rule shall take effect upon publication, as provided in s. 227.24 (1) (c), Stats.

SECTION 5. **BOARD ADOPTION.** The foregoing emergency rule was approved and adopted by the State of Wisconsin Natural Resources Board on _____.

Dated at Madison, Wisconsin _____.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By _____
Matthew J. Frank, Secretary

(SEAL)

Environmental Assessment on Rules to Protect Wisconsin Cave Bats and Manage *Geomyces destructans*, the Fungus Associated with White-Nose Syndrome

Wisconsin Department of Natural Resources

This Environmental Assessment is out for public comment through December 7, 2010 afterwhich it will be reconciled with the proposed rules.

Nicole Munkwitz
David Redell
Erin Crain
Gregor Schuurman
Tamara Ryan
Rori Paloski

November 2010

Introduction

White-nose syndrome (WNS) is a disease causing unprecedented mortality in cave bats. The fungus *Geomyces destructans*, the putative pathogen, is associated with WNS (Gargas et al. 2009, Frick et al. 2010). Since initial detection in 2006 in Howe cave, New York , WNS has been documented in fourteen states and two Canadian provinces, spreading rapidly in all directions from the first affected site. The Wisconsin Department of Natural Resources (WDNR) is responding to the threat of WNS to Wisconsin bats by creating management guidelines in a 'Surveillance and Response Implementation Strategy'. The Natural Resources Board adopted emergency rules in September 2010 listing the four cave bat species of Wisconsin as state threatened and listing the fungus *Geomyces destructans* as a prohibited invasive species. Additional authorities and tools were provided to help prevent the spread through anthropogenic means with an emergency rule adopted in October 2010. The underlying strategies embodied in this emergency rule are to allow for early detection of WNS in Wisconsin and outline preventative measures to slow the anthropogenic spread of the disease to and within Wisconsin. These three emergency rules are also proposed as permanent rules. This voluntary Environmental Assessment (EA) assesses these rules.

Table of Contents

Background 5
- Bat Ecology as it Relates to WNS 6
- Wildlife Disease Control 7
- Current WNS Management Plans 8
  - National 8
  - Regional 8
  - States and Provinces 8
- Federal Environmental Assessments 9
- Tribal Involvement 9
- Non-Regulatory Actions Taken by Wisconsin DNR 9
- Regulatory Actions Taken by Wisconsin DNR 10
- Actions Taken by Other Wisconsin State Agencies to Control WNS 12

Rule Review 13

1. Threatened Species Listing 13
- Rule Description 13
- Rule Summary 13
- Rule Authority 13
- Estimated Cost and Funding Source 13
- Proposed Action 13
- Effects 14
- Analysis of Alternatives to Early Detection 14
  - No Action 14

2. Prohibited Invasive Species Listing 15
- Rule Description and Provisions 15
- Rule Summary 15
- Rule Authority 16
- Estimated Cost and Funding Source 16
- Proposed Action 16
- Effects 16
- Analysis of Alternatives to Early Detection 17
  - No Action 17

3. Geomyces destructans *Management Rule* 17
- Rule Description and Provisions 17
- Rule Summary 17
- Rule Authority 17
- Estimated Cost and Funding Source 18

Early Detection 18
- Background 18
- Proposed Action 19
- Effects 19
- Analysis of Alternatives to Early Detection 20
  - No Action 20
  - Passive Surveillance 20

Preventive Measures 21

Background 21
Decontamination 22
Background 22
Proposed Action 22
Effects 23
Analysis of Alternatives to Decontamination 23
No Action 23
Partial Decontamination 24

Additional Preventive Measures Options 24
1. Management of the WNS-associated fungus (*Geomyces destructans*) 24
Effects 24
2. Management through Disease Identification and Testing in Bat Populations 25
Effects 25
3. Management through Environmental Modification 26
Effects 26
4. Management of Human Activities 26
Effects 27

Analysis of Alternatives to Preventive Measures 28
No Action 28

Literature Cited 29

Appendices 31

Background

Bats affected with white-nose syndrome (WNS) were first observed in 2006 at a single cave near Albany, New York. WNS has since been found in 14 states and 2 Canadian provinces, spreading up to 800 miles in 2009 (Turner and Reeder 2009). Mortality rates of affected colonies reach 100%. WNS has been linked to the death of over one-million bats since 2007 and threatens to cause the extinction of several bat species in the near future. According to a Consensus Statement issued at the WNS Emergency Science Strategy Meeting in May 2009, white-nose syndrome "... has caused the most precipitous decline of North American wildlife in recorded history." Last spring, the disease was detected within 225 miles of Wisconsin's southern border and 300 miles from the northern border. That means a WNS-infected cave is now located within the 280-mile dispersal range of Wisconsin little brown bats (Humphrey and Cope, 1976). Based on the disease's current location and known rate of spread, we anticipate the detection of WNS in Wisconsin as early as January 2011 as surveillance commences.

Hibernating bats are susceptible to WNS. Those infected tend to show a white fungal growth on their face, arms, legs, wings, and/or tail caused by the newly isolated and named fungus, *Geomyces destructans*. Infected bats exhibit atypical behavior such as daytime activity during winter hibernation, which rapidly depletes stored energy reserves. Wing damage and emaciation are also common.

To date, nine species of cave bats are affected by WNS, including the federally endangered Indiana bat, which historically was found in Wisconsin. All Wisconsin cave bats, which include the little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*), are among the species fatally affected by WNS. Consequently, Wisconsin's cave bat population as a whole is threatened by this devastating disease. The little brown bat is Wisconsin's most common bat species and because this species has seen the greatest mortality rate due to WNS, Wisconsin anticipates significant impacts to its cave bat populations when WNS begins to affect Wisconsin bats. Research published in the journal *Science* (Frick et al. 2010) states "...we expect a 99% chance of regional extinction of little brown myotis within the next 16 years."

Wisconsin has one of the highest concentrations of cave bat populations in the Midwest and large numbers of cave bats from neighboring states hibernate in Wisconsin. Consequently, Wisconsin's cave bat population, and those of surrounding states, is threatened by this devastating disease. Three hibernacula alone house over 300,000 bats, including all four cave bat species. The largest known hibernaculum in the state, Neda Mine, may also be the largest in the Midwest with a recorded population of 143,000. The little brown bat is the most common species in Wisconsin and given that this species has seen the greatest mortality rate due to WNS, Wisconsin is anticipating significant impacts to its cave bat populations when WNS begins to affect Wisconsin bats.

Bats are a vital part of many ecosystems and white-nose syndrome has significant environmental, economic, and public health impacts. All bats affected by WNS are insectivorous and a single little brown bat can eat up to 1,000 insects per night, often consuming large numbers of agricultural pests, which cost farmers and foresters billions of dollars per year. As predators of many insects, bats also may play an important role in reducing risk of human disease transmitted by flying insects. Bats play an important role in the unique and fragile cave ecosystems, and their disappearance would have significant impacts. The nutrients bats bring into caves, and upon which other cave species depend, often have no other means of entry. In many cases, only bats regularly move in and out of the cave environment, while other cave species must rely solely on

what is found or brought inside. Thus, the disappearance of bats from caves could affect the status of other species as well.

Research conducted at the United States Geological Survey (USGS) Wildlife Health Center has shown that *G. destructans* is transferred from bat to bat, and a multi-agency project demonstrated bats can develop WNS through infection directly from an affected cave environment, in the absence of infected bats.

There is also evidence of human transfer of *G. destructans* from site to site and/or bat via contaminated equipment, gear or clothing. The New York Department of Environmental Conservation, Wildlife Pathology Unit has isolated *G. destructans* fungal spores on equipment and clothing after exiting an affected cave. There have been long-distance jumps in the spread of WNS, beyond the distance bats move. These "jump" sites have been frequently-visited caves, often with small bat populations (Turner and Reeder 2009). The U.S. Geological Survey, National Wildlife Health Center has detected *G. destructans* fungal spores in cave sediment in the absence of bats, demonstrating persistence of the fungus (Lindner et al. *In Press*).

Even in the face of incomplete information, general epidemiological principles should be used to inform the WNS investigation and response. All available evidence indicates that WNS is caused by an infectious agent and can therefore potentially be spread by all known modes of disease transmission, including direct contact, inhalation, ingestion, inanimate objects, and human or animal vectors. Wildlife diseases such as WNS spread rapidly when there is high prevalence of pathogen(s), efficient chains of transmission, abundant susceptible hosts, and/or environments that allow pathogen persistence without a host. Regardless of the infectious agent (fungus, bacterium, or virus), universal precautions should be implemented. Universal precautions are procedures and guidelines designed to reduce incidence of disease by both preventing infections and breaking chains of transmission.

Bat Ecology as it Relates to WNS

Movements As WNS can be transferred from bat-to-bat, the potential distance an infected bat can travel becomes relevant to WNS management decision making. From coarse empirical data of within-season spread of WNS in Virginia from 2008 to 2009, potential seasonal bat movement could be inferred as a distance of 75 miles (Rick Reynolds, VA Dept. of Game and Inland Fisheries, pers. comm.). All four Wisconsin cave bat species are present in Virginia. Other studies of bat movement include both published and unpublished information on band recapture data of dispersed and migratory bats. There is a range of distances travelled among individual bats, bat species, and within different time frames (e.g., male dispersal distance in late summer and migration distance to/from winter grounds). Band recoveries or band resights found migration distance for little brown bat up to 280 miles (Humphrey and Cope, 1976) and dispersal distance up to 105 miles (Gerda Nordquist, MN DNR, pers. comm.). Kurta and Murray (2002) recaptured migrant Indiana bats (*Myotis sodalis*) an average of 286 miles from their summer location in Michigan. Distance travelled by Wisconsin bats is now greater than the distance WNS is detected from the state.

Mortality Hibernacula surveyed before and after WNS appeared have documented bat declines of more than 75%, and 90% to 100% in some cases (Blehert et al. 2009). Possible underlying conditions that cause bat susceptibility to fungal infection are unknown and for now the exact process by which infection leads to death remains undetermined. It is known that chronic disturbance of hibernating bats can lead to high winter mortality rates due to depleted fat reserves when food is scarce (Speakman et al 1991). WNS infected bats display aberrant behaviors, such

as daytime flights and roosting near cave and mine entrances with rapidly fluctuating temperatures or in colder areas, which in turn may lead to higher mortality of the infected bats. Scientific evidence also suggests that skin infection by *G. destructans* may be a primary cause of the mortality associated with WNS.

Predators Bats are major consumers of agricultural and forest pests, as well as mosquitoes which transfer West Nile Virus. These bats eat millions of insects every year and if their numbers are significantly reduced by WNS, the economic impact of increased crop damage could prove severe. One study estimated that bat control of a single agricultural pest in Texas alone was worth as much as $1.7 million dollars per year (Cleveland et al. 2009). Already, the U.S. Forest Service estimates that 2.4 million pounds of insects will go uneaten due to WNS. Bats reduce the necessity of insecticide applications, saving farmers up to hundreds of thousands of dollars annually. Bats are also a critical component of fragile cave ecosystems and their absence could lead to a cascade of impacts to rare invertebrate cave species.

Wildlife Disease Control

General goals for managing wildlife diseases include: 1) preventing introduction of disease; 2) controlling spread of existing disease; or 3) eradication of disease (Wobeser 2006). Disease control is in the prevention stage while management options continue to be developed and assessed. Prevention, slowing and controlling spread of WNS is a priority in Wisconsin at this stage in the progression of the disease. Although the natural movement of bats cannot be easily managed, it is possible to manage human-assisted transfer of *Geomyces destructans* and WNS. Measures to help prevent introduction of *Geomyces destructans* to hibernacula include measures of decontamination and/ or physical exclusion of bats or humans from hibernacula, and early detection of any infected sites to control further spread of the disease. In choosing disease management actions for prevention, or in response to a specific WNS detection event, specifics of each unique situation must be considered. This includes but is not limited to: the species and number of bats at risk or judged infected or exposed, the seasonal timing of WNS or *Geomyces destructans* detection, the characteristics of the cave/mine (including but not limited to ownership, access, physical features, other cave biota), the potential for implementing various control treatments at the site, as well as the geographic area and proximity to other hibernacula.

Current WNS Management Plans

National

Before a WNS management plan was completed, the United States Fish and Wildlife Service (USFWS) published a cave advisory in March 2009, which recommends suspending activities in caves to protect bats from white-nose syndrome (Appendix A). The Structured Decision Making (SDM) Initiative for WNS management, a collaborative of USFWS and several state natural resources agencies including the Wisconsin Department of Natural Resources (WDNR), was published in October 2009 (Szymanski et al.). The SDM reports on an analysis evaluating 23 management alternatives against six objectives in an attempt to determine how best to control the spread and minimize the effects of WNS on hibernating bats at the individual and population level. The highest scoring alternative action for areas greater than 75 miles away from WNS restricts cave and mine access, with appropriate decontamination and gear dedication procedures implemented, to commercial and research uses only.

In October 2010 the USFWS released a draft 'National Plan for Assisting States, Federal Agencies, and Tribes in Managing WNS in Bats' (Appendix B). The Plan's general recommendations for preventing infections and breaking chains of transmission include: avoid contact with bats, wear barriers (gloves, coveralls, etc.) if contact with bats is necessary and disinfect potentially contaminated items. Furthermore it recommends adhering to basic hygiene practices promoting personal surveillance as well as oversight of research, wildlife management and caving activities. Web-based links to the science based, and routinely updated, decontamination protocols for field researchers and cavers are provided (Appendix C, D and E).

Federal public land cave closures include: United States Forest Service (USFS) caves and mines in the 20 states of Region 9 (CT, DE, IL, IN, IA, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, WV, WI); the 13 states of Region 8 (KY, VA, TN, NC, SC, GA, FL, MS, AL, AR, LA, OK, TX); the five states of Region 2 (CO, KS, NE, SD, WY); Wayne National Forest, OH; Ottowa National Forest, MI; and Monongahela National Forest, WV. The National Park Service (NPS) has closed and mines in: Buffalo National River, AK and Great Smokey National Park TN/NC. The USFWS has a caving moratorium in 17 states (NH, MA, CT, VT, NY, PA, WV, VA, ME, RI, DE, MD, OH, NC, TN, KY) and closed caves in Wheeler National Wildlife Refuge, AL.

Regional

The USFWS is drafting a Region 3 (Midwestern states) WNS Contingency Plan similar to the national plan but it is not yet available. The WDNR continues to participate in the now USFWS Midwest region bi-monthly Midwest Bat Working Group conference call for state agencies and cooperators of Midwestern states. The purpose of the Working Group is to communicate and collaborate on WNS research, surveillance and management actions within the Region.

States and Provinces

ALABAMA: The first objective of the Alabama WNS Management Plan (Appendix F) is to "reduce the possibility of the spread of WNS in Alabama's bat populations and take other actions to conserve the values of the cave/karst ecosystem and similar areas". The Plan recommends the following strategies to accomplish this goal: 1) closures that protect significant bat caves yet permit appropriate recreational use of other caves, 2) request governments to require and private landowners to voluntarily implement, and cavers to use decontamination protocols, 3) partner with others who are affected by or work with bats or their habitat for conservation and early detection surveillance, 4) develop procedures to reduce the possibility of WNS spread from

infected caves, and 5) implement safe treatments of infected bats, caves, mines, and similar ecosystems.

GEORGIA: All people visiting caves and/or working with bats, including wildlife rehabilitators, are asked to follow USFWS disinfection protocols, reduce caving activities and respect public and private cave closure advisories. Disinfection protocols must be instituted in order to retain a GA DNR scientific research permit. No WNS positive bat may be released from rehabilitation. (Appendix G).

KENTUCKY: The Kentucky Department of Fish and Wildlife Services has released the "Bat Handling/Disinfection Protocol for Summer Bat Field Studies in Kentucky" for consultants and researchers to follow while working in bat sites during the summer months. (Appendix H)

MICHIGAN: Plan will be available soon.

MISSOURI: The Department of Conservation's (MDC) White-Nose Syndrome Action Plan requires that staff and permitees follow disinfection protocols when entering MDC caves and encourages the use at other caves. Wildlife Collector Permit holders are not allowed to bring any equipment into Missouri that has contacted bats in WNS-affected states and to disinfect any gear that has come into contact with bats in non-affected states before use in Missouri. Since WNS has been detected in Missouri hibernacula, MDC has closed entry to all MDC bat caves. (Appendix I).

NEW MEXICO: Cooperating agencies of NM released a WNS Response Plan with the primary objective of preventing potential human transmission and containing any novel occurrence of *Geomyces destructans* in the state. Access to public caves or mines with significant bat roosts has been restricted and access to other caves or mines requires decontamination protocol adherence. (Appendix J).

TENNESSEE: A Cooperative Monitoring and Response Plan (Arnold Air Force Base et al. 2009) aims to minimize potential for monitoring and research to contribute to the spread of WNS by implementing disinfection protocols, establishing a monitoring framework for early detection of WNS, and devising a response strategy for a WNS outbreak. The plan restricts public access to caves and mines on state owned lands including state parks, natural areas, forests, and wildlife management areas for the winter of 2009/2010. Exceptions to the cave closures were allowed with methods to limit the spread of WNS including designated gear or gear and clothing decontamination.

State owned public land cave closures or restrictions have been instituted in the nearby states of IL, IN, and MO as well as in the states of WV, VA, AR, TN, PA, NM, TX.

Federal Environmental Assessments N/A

Tribal Involvement The Great Lakes Indian Fish and Wildlife Commission was approach by the Department during the creation of this E.A. and will be sent a final version.

Non-Regulatory Actions Taken by Wisconsin DNR

Bat Population Monitoring. The Wisconsin Bat Conservation & Management Plan currently implements long term monitoring at several important hibernacula with surveys recording bat use and data loggers recording environmental conditions. In an effort to fill existing gaps of possible

sites used as bat hibernacula, WDNR started cataloguing cave and mine locations in Wisconsin in the spring of 2010. Further efforts are ongoing to determine if the caves and mines are suitable for bat use and will ultimately include collecting data on bat use. The resulting dataset will include: location of hibernacula, species of bats that use them and how many, distance from other hibernacula, bat movement among sites, site accessibility, and available survey resources. These data will allow managers to make the most informed decisions when setting priorities in WNS surveillance.

An effort to monitor the summer bat population of Wisconsin involves the Wisconsin Citizen-based Monitoring Network, which was started in 2007. Volunteers collect data at summer roost sites, including in some cases an index of breeding females at the maternity roost, as well as conduct mobile acoustic surveys on designated routes. This work provides valuable, multi-year data on Wisconsin's bat populations to determine species distribution, seasonal movements and species status and trends.

WNS Surveillance All techniques for monitoring Wisconsin bat populations allow for WNS surveillance opportunities hence the two goals are integrated into a single effort.
WDNR also continues to track or investigate all public reporting of bats displaying unusual behaviors and sick, dead or dying bats through an online submission form. As was found in eastern states during the initial spread of WNS, unexplained increases in submissions of bat reports may provide anecdotal evidence about the onset of WNS. Such data or reports may also assist in locating previously unidentified hibernacula by mapping bat reports or result in a survey of nearby hibernacula or other bat roosts.

WNS Research WDNR has been and will continue to be involved in multi-agency collaborative white-nose syndrome research.

Communications Outreach to stakeholders and public is ongoing. The Department has been contacting stakeholders potentially impacted by the rule and working to get information to the public. Stakeholders include commercial caves and mines, active underground mines, private cave and mine owners, recreational cavers, agriculture and forest industries, animal control operators, wildlife rehabilitators, and conservation organizations. General WNS information and links to other WNS pages can be found on the WDNR Bureau of Endangered Resources web site.

Disease Control Disease control is in the prevention stage while management options continue to be developed and assessed. Department activities have centered on determining the size of our cave bat population, identifying potential hibernacula, decontamination, and developing voluntary agreements with cave and mine owners.

Regulatory Actions Taken by Wisconsin DNR to Control WNS

Wisconsin bats, notably the little brown bat, migrate up to 280 miles between their summer and winter habitat. When WNS was found within 280 miles of the Wisconsin border (~225 miles from the southern border) in April 2010, Wisconsin increased its WNS disease management efforts. Knowing the potential for WNS to be found in Wisconsin as early as winter 2011, the department put into place tools needed, via emergency rules and permanent rule proposals, to both slow the arrival of the disease to the state, and slow the spread of the disease once in the state.

In September 2010 the Natural Resources Board approved two emergency rules and gave permission to go to public hearings for identical proposed permanent rules. The first emergency

rule lists the four native cave bat species of Wisconsin as threatened species under NR 19. Listing cave bats as threatened prohibits disturbance of the bats during hibernation, prohibits the possession or transfer of the animals, and decreases the overall number of bats taken through minimization efforts from alternative sources of mortality. The effects of WNS on the cave bat community in the Northeastern states are devastating and it's already predicted that the little brown bat has a 99% chance of being regionally extirpated within the next sixteen years. Cave bats of Wisconsin met three criteria for assessed changes in population condition indicating the need for the rule change. First is the need for immediate protection (from a new threat, in this case WNS). The second and third criteria points are unrelated to this emerging disease: there has been a significant change in the Natural Heritage Inventory State Rank for these species since 1997, and the little brown bat has been recommended for listing since 1997.

While emergency listing the cave bat species in WI as threatened provides protection to the animals, it does not affect the spread of the fungus. The second emergency rule adds the fungus *Geomyces destructans* to the list of prohibited invasive species in NR 40. This listing gives the Department regulatory authority to limit human transport of the fungus.

Geomyces destructans meets the definition of invasive species as it is nonnative to the state, never having been found in soil samples here. Recent peer-reviewed journal articles have found and described the same fungus in six European countries (Wibbelt et al. 2010, Martinkova et al. 2010) adding support to the hypothesis that it is of European origin. There are no bat species that travel between continents and it is not known how it may have arrived in North America.

Furthermore *Geomyces destructans* meets the definition of a prohibited invasive species in the following ways:

1) Based on evidence from the states where WNS has been found, the fungus has the potential of greatly reducing or extirpating four of WI's eight bat species. Bats are primary predators of night flying insects, many of which are agricultural, forest, and human health pests. Indirect and direct economic impacts are tied to likely increases in chemical pesticides needed to combat the agriculture and forest insect pests when the ecosystem services of the insectivorous bat species populations decline.

2) The species has not been found in soil samples and winter surveillance in WI for the fungus during the 2009/2010 hibernacula counts, indicated no current signs of the fungus present. Neighboring states surveillance for the disease shows the fungus as close as 225 miles south of our border in Missouri and 300 miles north of our border in Ontario Canada.

3) A study last year using WI bats transported to two hibernation sites in VT showed that the fungus remains present in the environment after all of the bats within a cave are eradicated. Given the spread and continued establishment in all of the states it has entered, it shows that spread continues throughout each location. There is evidence to support the ability of *Geomyces destructans* to establish itself in Wisconsin caves and mines.

4) There are several options for controlling the species' spread within the state. Current decontamination protocols are relatively inexpensive and effective at preventing transfer from site to site through human spread. On-site cave and mine management includes closure to unauthorized human access through signage and bat-compatible cave gates. There are a limited number of hibernacula in the state making it feasible to implement control efforts having long-term protection benefits. Environmental control methods and treatment of bats once the fungus is present at a site is currently being researched. There

are actions presently available to help slow the spread while additional treatment options become available at a future time.

5) There is no recognized or likely beneficial use or commercial value to the fungus *Geomyces destructans*. The negative socio-economic impacts are related to reduced recreational opportunities for cavers, increased agricultural and forestry expenses for combating additional insect pests, and reduced production at organic farms. Wildlife viewing areas to watch fall swarming behavior at hibernacula would no longer be an option for citizens interested in experiencing the night-time flight emergence of one of Wisconsin's natural resources.

In October 2010 the Natural Resources Board approved a third emergency rule and gave permission to go to public hearings for additions to NR 40 dealing with the management of white-nose syndrome. These rule changes gave the Department regulatory authority to access caves and mines for monitoring and surveillance and to enact management actions at sites where WNS may become introduced thereby providing reasonable and feasible means of slowing or stopping the spread. The rule changes define how and under what circumstances the department will implement management actions needed to be in place for this winter's hibernation season.

The three rule changes on their own are justifiable, but potential results of doing nothing appear grave to many resources in Wisconsin. All bat species in Wisconsin are insectivorous and provide an ecosystem service that cannot be easily replaced once they have declined or have been lost from system. To do nothing is an option that would have long-lasting impacts to the agricultural and forestry industry economics. Organic farmers do not have the option of increasing use of pesticides because they rely on alternative forms of pest reduction using integrated pest management. Losing bats as their natural ally of the primary predator of night flying insects, organic and small family farmers are likely to undergo an economic impact reducing production of their marketable goods.

Bats of Wisconsin travel large distances, sometimes hundreds of miles, from their summer roosting areas to their overwintering grounds to hibernate. Wisconsin has some of the Midwestern United States largest populations of cave bat species, it is also known that Wisconsin share bats with its neighboring states. Doing nothing impacts not just the residents and ecosystems of WI, but also impacts our surrounding states natural resources. There is the potential of losing not a single species of bat, but an entire taxonomic group from the region if this invasive species of fungus is allowed spread unchecked.

Actions Taken by Other Wisconsin State Agencies to Control WNS N/A

Rule Review

1. Threatened Species Listing

Rule Description
Due to the immediate threat of white-nose syndrome in Wisconsin, the Department proposes to add the following cave bat species to Wisconsin's threatened species list, NR 27.03 (3), Wis. Admin. Code: little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*). In anticipation of listing, DNR will issue broad incidental take guidelines.

Rule Summary
The proposed rule change seeks to provide protection to Wisconsin's cave bat species, whose populations have declined at a national level due to white-nose syndrome and are imminently threatened by the disease in the state. Listing will prohibit the transport, possession and disturbance and decrease mortality of four WI cave bats species: little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*). Listing these species before WNS has been detected in Wisconsin will allow the Department time to work collaboratively with stakeholders to ensure that appropriate conservation measures, such as the protection of refuge hibernacula, are developed and in place in the event that WNS arrives in Wisconsin. The disappearance of cave bats from the ecosystem will have significant economic, environmental and public health impacts.

A broad incidental take permit/authorization would be created, as provided for under s. 29.604, Wis. Stats. The broad incidental take permit/authorization would allow for the incidental taking of state listed cave bats that may occur as a result of specific public health concerns, bat removals, building demolitions, forestry activities, bridge demolitions, miscellaneous building repairs and wind energy development projects. Some take of bats may still occur as a result of these activities, however take will be minimized by following specific minimization measures. The department has concluded that the projects covered under this permit are not likely to jeopardize the continued existence and recovery of the state population of these bats or the whole plant-animal community of which they are a part; and has benefit to the public health, safety or welfare that justifies the action. This incidental take permit/authorization is only needed when a bat is present or suspected to be present (e.g., Natural Heritage Inventory report of bats in the area, evidence of bat presence).

Rule Authority
DNR authority for these rules is granted in state statutes 29.604, 227.11, and 227.24 Wis. Stats.

Estimated Cost and Funding Source
The department will be issuing a broad incidental take permit/authorization associated with the listing that will cover take caused by many private companies and organizations such as pest control operators, construction companies, and wind energy development. It is assumed the impact to farmers of this rule change will be positive; especially in light of the fact that if bat populations in the state were to be devastated, the costs to agriculture from pest destruction of crops and pesticide use would increase.

Proposed Action
Listing the little brown bat, big brown bat, northern long-eared bat and eastern pipistrelle as threatened species in Wisconsin.

Effects
Listing the cave bats as threatened species will allow the department to effectively regulate the take, transport, possession or disturbance of these four species.

Affected constituencies include commercial caves and mines, private cave and mine owners, recreational cavers, wildlife rehabilitators, animal control operators, the agricultural industry, the conservation community, wind utilities, WI Department of Transportation (WDOT) and homeowners. Concerns will likely include how listing the bats will affect current activities. Many of these potential concerns will be addressed through a broad incidental take permit/authorization and voluntary agreements so that the listing does not have a significant economic impact on a substantial number of small businesses.

A broad incidental take permit/authorization would be created, as provided for under s. 29.604, Wis. Stats. The broad incidental take permit/authorization would allow for the incidental taking of state listed cave bats that may occur as a result of specific public health concerns, bat removals, building demolitions, forestry activities, bridge demolitions, miscellaneous building repairs and wind energy development projects (see the "Broad Incidental Take Permit/Authorization for Cave Bats" attachment for more information). Some take of bats may still occur as a result of these activities, however take will be minimized by following specific minimization measures and the department has concluded that the projects covered under this permit are not likely to jeopardize the continued existence and recovery of the state population of these bats or the whole plant-animal community of which they are a part; and has benefit to the public health, safety or welfare that justifies the action. This incidental take permit/authorization is only needed when a bat is present or suspected to be present (e.g., Natural Heritage Inventory report of bats in the area, evidence of bat presence).

Analysis of Alternatives

No Action Under the 'no action' alternative the four cave bat species would not be listed as threatened and there would therefore be no additional regulation of take, transport, possession or disturbance related to these species.

2. Prohibited Invasive Species Listing

Rule Description
The proposed changes to ch. NR 40, Wis. Adm. Code, will add the fungus, *Geomyces destructans*, to the list of prohibited invasive species, allowing the department to effectively manage its spread and limit human transport.

Existing rules ban the transportation (including importation), possession, transfer (including sale) and introduction of invasive species that are listed or identified as "prohibited", with certain exceptions. Transportation, possession, transfer and introduction without a permit are exempt if the department determines that the transportation, possession, transfer or introduction was incidental or unknowing, and was not due to the person's failure to take reasonable precautions. Existing rules authorize the department to enter property with the permission of the owner or person in control of the property and, if permission cannot be obtained, to seek an inspection warrant from the Circuit Court. Entry is only for the purpose of inspection, sampling or control of prohibited invasive species.

The current rules also allow the department to enter into consent orders with persons who own, control or manage property where prohibited invasive species are present to implement approved control measures, and to issue unilateral orders for control purposes unless the person was not responsible for the presence of the prohibited invasive species. If a control order is not complied with and the department undertakes control measures, the current rules allow for cost-recovery by the department for the expenses it incurred.

Rule Summary

Due to the immediate threat of white-nose syndrome in Wisconsin, the department proposes to add *Geomyces destructans*, the fungus that causes white-nose syndrome, as a prohibited invasive species under NR 40.04, Wis. Admin. Code, via emergency rule. Chapter NR 40, Wis. Admin. Code establishes a classification system for invasive species and regulates those in the prohibited and restricted categories. It also establishes preventive measures that when followed, will help minimize the spread of invasive species into or around the state. To ensure long-term regulatory authority for this species the department will propose adding it to Ch. NR 40, Wis. Admin. Code through a permanent rule change in the near future.

While the need to act immediately on white-nose syndrome is clear, 2009 Wis. Act 55, Invasive Species Bill, authorizes the department to promulgate emergency rules to identify, classify or control an invasive species, without a finding of emergency. Such emergency rules can remain in effect for as long as two years or when it is replaced by a permanent rule if earlier.

Existing rules ban the transportation (including importation), possession, transfer (including sale) and introduction of invasive species that are listed or identified as "prohibited", with certain exceptions. Transportation, possession, transfer and introduction without a permit are exempt if the department determines that the transportation, possession, transfer or introduction was incidental or unknowing, and was not due to the person's failure to take reasonable precautions. Existing rules authorize the department to enter property with the permission of the owner or person in control of the property and, if permission cannot be obtained, to seek an inspection warrant from the Circuit Court. Entry is only for the purpose of inspection, sampling or control of prohibited invasive species. The listing of the fungus that causes WNS may result in the need for cavers to decontaminate caving equipment or avoid environmentally sensitive areas.

The current rules also allow the department to enter into consent orders with persons who own, control or manage property where prohibited invasive species are present to implement approved control measures, and to issue unilateral orders for control purposes unless the person was not responsible for the presence of the prohibited invasive species. If a control order is not complied with and the department undertakes control measures, the current rules allow for cost-recovery by the department for the expenses it incurred.

Rule Authority

DNR authority for these rules is granted in Sections 23.09 (2) (intro.), 23.091, 23.11 (1), 23.22 (2) (a) and (b) and (2t) (a), 23.28 (3), 27.01 (2) (j), 29.039 (1), 227.11(2)(a), and 227.24 (1) (a), Stats.

Estimated Cost and Funding Source

Many potential stakeholder concerns may be addressed through cost-sharing, technical support, and education provided by the department. Examples include: reviewing proposed research proposals and issuance of scientific research licenses, cost-sharing for installation of bat gates and other conservation actions, providing cave/mine closure signage and decontamination protocols, and providing locations of caves that may be used for recreational caving activities (where bats are known to have been excluded).

Proposed Action
Adding the fungus that causes white-nose syndrome, *Geomyces destructans*, to the list of prohibited invasive species in Wisconsin.

Effect
Listing *Geomyces destructans* as a prohibited invasive species will allow the department to effectively manage its spread and limit human transport by regulating its possession, transportation, transfer and introduction.

Affected constituencies include commercial caves and mines, private cave and mine owners, recreational cavers, property owners, the agricultural industry, and the conservation community. Concerns will likely include how listing the fungus will affect current activities. Many of these potential concerns may be addressed through cost-sharing, technical support, and education provided by the department. Examples include: reviewing proposed research proposals and issuance of scientific research licenses, cost-sharing for installation of bat gates and other conservation actions, providing cave closure signage and decontamination protocols, and providing locations of caves that may be used for recreational caving activities (where bats are known to have been excluded).

Under NR 40, the department may ask any person who owns, controls, or manages property where a prohibited species is present to control the prohibited species in accordance with a plan approved by the department. While a person who owns, controls or manages property where a prohibited species is present is responsible for controlling the prohibited species that exists on the property, the department will seek funds to assist in the control of prohibited species. Therefore, conducting control measures will not necessarily result in a cost to commercial cave operators. Additionally, commercial caves will have the option to exclude bats from their cave(s) with the help of the department, allowing them to remain open for tourism, and resulting in no loss of tourism dollars.

Analysis of Alternatives

No Action
Under the "no action" alternative the fungus *Geomyces destructans* would not be listed as a prohibited species and there would therefore be no regulation of possession, transportation, transfer or introduction of this species.

3. White-nose Syndrome Management

Rule Description
The proposed rule lists *Geomyces destructans* as a prohibited invasive fungus species under Chapter NR 40, Wis. Adm. Code which establishes a classification system for invasive species and regulates those in the prohibited and restricted categories. The added provisions to s. NR 40.04 and 40.07 relate to early detection and prevention of the spread of WNS due to anthropogenic activities.

The Rule also sets out authority for the department to grant written exemptions from the new decontamination requirements if it would not allow WNS to be transported to other locations and adds the following key definitions:

"Cave" means any naturally occurring void, cavity, recess or system of interconnected passageways beneath the surface of the earth or in a bluff, cliff or ledge, including pits and sinkholes, but does not include a rock shelter.

"Mine" means any artificial excavation, shaft, underground passageway, slope, tunnel or working from which ore or mineral is or was extracted, but does not include an open pit mine. However, caves or mines may be located adjacent to open pit mines.

"Near" means, for purposes of s. NR 40.07 (8), within 100 feet of.

"Rock shelter" means an overhang or cave-like opening in a bluff, cliff or ledge that is shallow and does not provide an area of substantial daytime darkness.

Rule Summary

The proposed rule provides the tools for early detection of WNS in Wisconsin, requires decontamination procedures of persons and gear entering caves and mines, and allows physical exclusion as a means to prevent spread of *Geomyces destructans*. *Geomyces destructans* has been identified as the fungus associated with white nose syndrome in cave bats. Because the department has little if any control over the natural movements of bats, the main focus in WNS management is on removing humans as a vector for spreading the disease. It establishes these preventive measures, that when followed will help minimize the spread of this invasive species into or within Wisconsin.

Under the proposed rules, the public will be asked to take preventive measures that are meant to slow the introduction and spread of Geomyces destructans in the state. The department is seeking funding to assist with the installation of barriers, and therefore cost to those parties who install such barriers should be negligible. Additionally, commercial caves will have the option to exclude bats from their cave(s) with the help of the department, allowing them to remain open for tourism, and resulting in no loss of tourism dollars. Finally, the department will work with active underground mines to develop control plans that will not hinder mining operations.

Under current ch. NR 40, the department may ask any person who owns, controls, or manages property where a prohibited species is present to control the prohibited species in accordance with a plan approved by the department. While a person who owns, controls, or manages property where a prohibited species is present is responsible for controlling the prohibited species that exists on the property, the department will seek funds to assist in the control of prohibited species.

The department will normally follow an informal, stepped enforcement process in order to obtain compliance with invasive species rules. This process involves informal discussions between department staff and the individual, landowner or company, notifying the person of potential violations and providing guidance on how to comply with the rules. Notices of non-compliance may follow if necessary. If formal enforcement is necessary, ch. NR 40 will be enforced by department conservation wardens, county district attorneys, and circuit courts through the use of citations and civil or criminal complaints. Civil and criminal enforcement may also be carried out by department referral of violations to the Wisconsin Attorney General, with prosecution and abatement actions in the circuit courts. Criminal enforcement will be limited to intentional violations. Finally, violations of the permits issued under ch. NR 40 also may be enforced by administrative permit revocation proceedings.

Rule Authority

DNR authority for these rules is granted in Sections 23.09 (2) (intro.), 23.091, 23.11 (1), 23.22 (2) (a) and (b), 23.28 (3), 27.01 (2) (j), 29.039 (1) and 227.11(2) (a), Wis. Stats.

Estimated Cost and Funding Source
The department is working with the few commercial caves businesses to address decontamination or exclusion or other measures to assure their business and prevent the spread of Geomyces destructans. The rule may have favorable effects on a number of businesses by preventing the introduction or limiting the spread of WNS, thereby preserving the agricultural, economic and environmental benefits associated with healthy bat populations. The cost of decontamination will be minimal. The cost of excluding bats at a cave with high human visitation would be $100-$1,000. The department is seeking funds to cover these costs. The cost of caving gear typically ranges from $125-$750. Very few sites in Wisconsin require vertical climbing gear. The cost of signage at caves and mines would be $0 because the department will provide the signs.

Early Detection

Background
Since WNS was first discovered in New York in 2006, it has continued to spread to nearby and distant hibernacula in the Northeast. *Geomyces destructans* in North America has only been found in hibernacula where WNS is known to occur (Lindner et al. *In Press*). Data on WNS observations continue to be collected throughout North America but the spread is still poorly understood and no epidemiologic models exists. The spread of the fungus and the disease in the past year has been more rapid than initial movements suggested and winter 2009/Spring 2010 occurrences of WNS were discovered in Missouri and Ontario, Canada. Based solely on what has been observed to date, *Geomyces destructans* may arrive in Wisconsin as early as the winter of 2010/2011 on bats migrating from the north or south, or on humans from any infected site (Turner and Reeder 2009).

Monitoring bat populations in Wisconsin, currently considered WNS free, is crucial for two reasons: pre-WNS baseline data collection and early disease detection. Critical baseline data on parameters such as population densities, hibernaculum locations, health (e.g., pre-torpor body condition and wing damage in unaffected bats), reproductive status, and hibernaculum microclimate data are needed from unaffected locations for on-going research dedicated to understanding the disease and informing a coordinated national and regional response. Furthermore, early detection will give managers and researchers the greatest opportunity to develop and experiment with control methods focused on stopping or slowing the spread of the disease. A better understanding of the bat population in Wisconsin will allow managers to measure the efficacy of management decisions and gauge the overall effect of management and disease-response on the state's bat population as a whole. As well, baseline data will guide conservation and recovery efforts.

Early detection requires active surveillance of hibernating bats. Active surveillance is achieved by visiting the interior of hibernacula to look for signs of WNS, such as fungal growth on bats, abnormal behavior, and changes in distribution within hibernacula. Active surveillance goes along with population monitoring so that in the process of looking for early signs of WNS, the number of bats, species, and location within the hibernacula can also be recorded. Hibernating bats should be disturbed as little as possible during surveillance, and thus visits should be limited (only one or possibly two/season) and should involve as few individuals as possible. Furthermore, researchers should keep as much distance as possible between themselves and the bats to avoid waking them.

The goal of the current, and largely completed, effort to catalogue all of Wisconsin's caves and mines is to identify all important natural and artificial roosts. Sites are to be prioritized for

monitoring, surveillance, management, and conservation efforts based on site details and significance to the population as a whole. For example, sites that contain the largest or most diverse populations and the most threatened or endangered species will be given higher priority. Cave and mine roosts are categorized for prioritization according to 1) total numbers of bats accommodated, 2) number of species sheltered, 3) apparent value of the site in meeting bat needs, 4) long-term safety of the site, if protected, 5) known threats if not protected, and 6) context in relation to nearby hibernacula, and 7) status of the species involved. If time is limiting for surveillance, effort will be given to higher priority sites.

Proposed Action

Because the time and place of *Geomyces destructans* arrival in Wisconsin cannot be known in advance, early detection is critical to: 1) learn more about the epidemiology of the fungus and of WNS, 2) allow managers time to consider all management options and implement using the best available techniques for responding to outbreaks of WNS. Department staff will need landowner permission or must pursue an inspection warrant, to access caves and mines in order to monitor, survey, and inspect for the presence of *Geomyces destructans.*

Effects

Disease Control. As with any epidemic, early detection of *Geomyces destructans* increases the probability of success of containing, or slowing the spread of the fungus from the affected site (i.e., early detection strategies for avian influenza, gypsy moth, and emerald ash borer). Furthermore, early detection will give managers the chance to re-prioritize future surveillance, evaluate disease control options before the end of the hibernation season, and participate in disease control research.

Ecologic & Cave Ecosystem. Any time people enter a bat hibernaculum, they may disturb hibernating bats and introduce foreign substances to the cave ecosystem. Hibernating bats cannot survive constant or repeated disturbance, which wakes them during hibernation (Speakman et al. 1991, Thomas et al. 1990) and causes them to deplete energy reserves needed to hibernate until spring. Active surveillance that limits the number of visits and minimizes any potential disturbance to bats, however, is not mortally detrimental to healthy bats (Boyles and Brack 2009). Early detection of WNS is unlikely to change the ultimate fate of infected individuals until a cure for WNS is developed. However, early detection can potentially have a dramatic effect on bats at the population level by giving managers the time to contain the disease outbreak in the hibernaculum. With the proper disinfection protocol there should be minimal effects of early detection on the bats and cave ecosystem.

Socio-economic. WDNR is already receiving positive feedback and concern for the bats from the general public, early detection of a WNS infection within the state of Wisconsin may trigger even greater public concern for native bats. This support may be instrumental in combating and tracking the disease. The loss of cave bats from the environment could mean an increase in the density of pests affecting agriculture and human health. Early detection of WNS would be an early warning to the agricultural industry of the potential need for increased amounts of manufactured pesticides. The loss of bat control on mosquito populations could mean the increase in the number of mosquitoes carrying disease infections to humans and animals (i.e. West Nile Virus). Early detection of WNS will give human health providers an early warning to be vigilant about diseases carried by mosquitoes. The department has provided and will seek additional funds for cave/mine owners to implement preventive measures. Notifying the public that the commercial caves are safe, environmentally friendly sites may increase visitation.

Analysis of Alternatives to Early Detection

No Action. Under the 'no action' alternative there would be no effort to detect the introduction of the fungus *Geomyces destructans* and WNS to Wisconsin hibernacula. Bat population monitoring would not change from current WDNR population monitoring and research effort levels. Disease detection under this alternative would involve late stage manifestation recognized by the public when large numbers of dead and dying bats are found on private property.

Disease Control. In the absence of early detection through active surveillance, researchers lose the ability to track and study the disease, and develop concrete parameters for epidemiological models. Managers may not have a chance to attempt control or containment measures before remaining living bats disperse from the hibernaculum in spring. Early detection may still arise from continued current-level bat population monitoring but is less likely without active surveillance. Under 'no action' bats carrying the fungus are more likely to disperse from the hibernacula and contaminate other individuals and roost sites resulting in a greater rate of increase in *Geomyces destructans* prevalence, more rapid spread of WNS and a quicker regional population collapse.

Ecological & Cave Ecosystem. Because surveillance that limits the number of visits and minimizes any potential disturbance to bats is not mortally detrimental to healthy bats, 'no action' changes little for these individuals. 'No action' may benefit sick bats if the result means no hibernacula visits that disturb them during hibernation. Conversely the bat population on the whole will be negatively affected by 'no action' if it leads to an inability to control the spread of *Geomyces destructans* following the hibernation season. No action changes little for the cave ecosystem.

Socio-economic. 'No action' means there will likely be no early warning for the decline in summer resident bats and the subsequent increased number of pests including disease carrying mosquitoes. The lack of early warning decreases the time to prepare by both human health providers and the agricultural industry, including organic farmers who do not rely on pesticides for pest control.

Passive Surveillance. The alternative of using Passive surveillance involves techniques of compiling information from incidental reporting, such as bat submissions to rabies labs and public calls about dead bats to state wildlife agencies and wildlife rehabilitators. Information from these sources can be unreliable, but can also serve as a "red flag" to identify new areas for priority monitoring and surveillance. Passive data have been useful for locating previously unknown bat hibernacula and late stage WNS affected areas experiencing high mortality.

Disease Control. Passive surveillance for the occurrence WNS relies on incidental detection of the disease making early detection unlikely. If WNS is confirmed, the exact hibernacula a sick bat has emerged from may still not be known and researchers lose the ability to track and study the disease. Managers may not have a chance to attempt control or containment measures before remaining living bats disperse from the hibernaculum in spring. With passive surveillance bats carrying the fungus are more likely to disperse from the hibernacula and contaminate other individuals and roost sites resulting in a greater rate of increase in *Geomyces destructans* prevalence, more rapid spread of WNS and a quicker regional population collapse.

Ecologic & Cave Ecosystem. Passive surveillance does not require entrance into hibernacula until enough evidence suggests the disease is present and there is enough information about the

possible location of the disease outbreak. The bat population on the whole will be negatively affected by 'passive surveillance' if it leads to an inability to control the spread of *Geomyces destructans* during the hibernation season.

Socio-economic. Early detection through passive surveillance is unlikely and without it there will be no early warning for the decline in summer resident bats and subsequent increased number of pests including disease carrying mosquitoes. The lack of early warning decreases the time to prepare by both human health providers and the agricultural industry, including organic farmers who do not rely on pesticides for pest control. There is concern that undetected WNS infection in human visited caves, including bat occupied commercial caves, would lead to increased human exposure to many moribund bats with potential disease of human concern. Without early detection there is little time to prepare for the proper disposal of large WNS caused die-off events.

Preventive Measures

Early detection and decontamination work hand in hand to slow the spread of the invasive fungus and enable the department to respond in a focused and timely manner with additional preventive measures to reduce fungal transmission. The department will work with those who enter caves or mines – including but not limited to researchers, recreational cavers, tourists, and commercial cave and mine operators – to implement decontamination protocols and additional preventive measures to reduce the risk of fungal movement from site to site. Decontamination is a widely accepted starting point for transmission-risk reduction, and additional preventive measures are outlined here to further reduce risks; suitability of each of these additional measures depends on site characteristics and landowner goals. The department will work with individual landowners to meet their goals with a preventive measures plan approved by the department.

Background

The science of WNS control is under development, and many answers are still emerging. Research throughout the nation is ongoing and regular updates critical to WNS management decision-making are made available to federal and state WNS managers on a regular basis. Implementation of any action will need to be informed by current best available science and by the situation surrounding the site. Therefore any disease management option needs be considered, both for prevention of introduction of WNS into new areas, and for control of WNS where it is detected.

Disease management options need to be chosen in response to a specific WNS detection event. Chosen actions will be based on the specifics of the situation, including, for instance: the species and number of bats judged infected or exposed, the seasonal timing of WNS detection, the characteristics of the cave/mine (including ownership, access, physical features, other cave biota), the potential for implementing various control treatments at the site, the geographic area, and proximity to other hibernacula.

The best available scientific data, including risk analysis results of the structured decision making process (Szymanski et al. 2009), support cave closure for publicly and privately owned caves. The USFWS has a cave moratorium in the states affected by WNS and recommends decontamination in non-affected states to prevent the anthropogenic spread of *Geomyces destructans*. The USFS has closed cave/mine access in the 20 states of Region 9 (Northeastern states), the 13 states of Region 8 (Southeastern states), the five states of Region 2

(Rocky Mountain states), Wayne National Forest, OH; Ottowa National Forest, MI; and Monongahela National Forest, WV. Indiana restricted state-owned cave access and following discovery of WNS in a Missouri cave, other Midwestern states have closed all visitor access to state managed bat caves: Missouri-2010, Illinois-2010, and Iowa-2010.

There are approximately 120 known bat hibernacula in Wisconsin, and approximately 12 of these are public caves. In addition, less than 20 of the caves and mines in Wisconsin are routinely used for recreational caving, and less than 10 are commercially operated caves.

Decontamination

Background

Geomyces destructans can be transferred bat to bat, cave to bat, and from cave to equipment or equipment to cave. Laboratory experiments conducted at the USGS National Wildlife Health Center (Madison, WI), have demonstrated that healthy bats can contract WNS directly from infected bats housed in the same cage. Cave-to-bat contamination was documented in a multi-agency field experiment in which healthy bats from Wisconsin were moved into two WNS-infected hibernacula in the Northeast. Although sick bats were absent from the cave, healthy Wisconsin bats were colonized by *Geomyces destructans* , and developed WNS symptoms. Finally, cave-to-clothing/gear transfer was observed when the New York Department of Environmental Conservation, Wildlife Pathology Unit isolated and cultured *Geomyces destructans* fungal spores on equipment and clothing after exiting an affected cave.

A human role in inadvertently carrying *Geomyces destructans* spores from an infected site to a clean site on clothing, shoes, or gear has been accepted as possible (Sleeman 2009), and is supported by long-distance jumps in the spread of WNS beyond the distance bats would likely transmit the disease. These "jump" sites have been frequently-visited caves, often with small bat populations (Turner & Reeder 2009). The U.S. Geological Survey, National Wildlife Health Center isolated *Geomyces destructans* fungal spores in cave sediment, demonstrating that infected caves are persistent reservoirs of environmental contamination that may continue to spread the disease to other sites via human activities long after the cave's hibernating bats have been wiped out (Lindner et al., *In Press*).

The USFWS has recognized and responded to the possibility of human WNS transmission by creating decontamination protocols for field researchers and recreational cave users - the two most frequent groups to visit caves and therefore likely to contaminate sites (Appendix C & D). Although gear and clothing can be disinfected, there is currently no safe way to decontaminate an infected cave without substantially impacting the cave ecosystem, nor is there a protocol to decontaminate infected bats. Based on the devastating effects of WNS on bats populations in other states – and the fact that *Geomyces destructans* cannot be safely removed from a cave at this time – the USFWS National Response Plan and Strategic Decision Making Initiative (Szymanski 2009) recommend that WNS-free states implement strict biosecurity measures to minimize the risk of anthropogenic transmission of the fungus into caves.

The proposed rules to add restrictions regarding gear being used in Wisconsin and require decontamination before and after entering caves or handling bats are among the few tools currently available to slow the spread of WNS.

Proposed Action

The decontamination measures include 1) a prohibition on equipment, gear, clothing and other objects used in or near a cave in a state outside WI from being brought near or placed into a cave

or mine in Wisconsin, 2) decontamination of equipment, gear, clothing and other objects that have been in or near a cave or mine within WI before they can be brought into another Wisconsin cave or mine, 3) decontamination of all equipment, gear, clothing and other objects that have been in or near a cave or mine in Wisconsin immediately upon exit, and 4) decontamination of all equipment, gear, clothing and other objects that will be or have come in contact with bats (including, but not limited to nets, traps, weighing tubes, bat bags, wing punches, rulers, clothing, gloves, electronic equipment and exclusion materials) and all individuals handling bats prior to and immediately after contact.

Effects

Disease Control. Simple disinfection procedures can play a big role in infectious–disease prevention and control. It is not possible to decontaminate bats, but decontamination of equipment and clothing can help prevent the anthropogenic transmission of *Geomyces destructans*, and may slow the spread of WNS to and throughout Wisconsin.

Ecological & Cave Ecosystem. Decontamination procedures benefit bats and caves by reducing the risk of anthropogenic transfer of *Geomyces destructans* to the cave ecosystem. Decontamination may also help prevent the introduction of other foreign fungi, bacteria or viruses to the cave ecosystem. These steps may slow the spread of WNS and buy time while ongoing research works to develop suitable treatments for bats and/or the cave environment.

Socio-economic. Decontamination places a time and cost burden on individuals traveling to caves or working with bats for research, recreation, or rehabilitation, but does not preclude these activities. Extra costs may include the purchase of appropriate decontamination materials and detergents and the purchase of a set of gear for dedicated use within Wisconsin. Time costs include extra time to disinfect clothing and equipment before and after entering a cave or mine, or coming into contact with bats. The general public is well versed in simple methods to prevent the spread of infectious disease (i.e. wash your hands with soap and warm water, or cover your mouth when you cough…) and will likely support the necessary steps to control the spread of the disease.

Analysis of Alternatives to Decontamination

No Action

Under the 'no action' alternative there would be no obligation to decontaminate before or after entering a cave environment or when working with bats. Furthermore, no restrictions would exist for gear coming from other states including known WNS-affected states.

Disease Control. 'No action' provides zero control on the anthropogenic transmission or spread of the disease. WNS may arrive in the state of Wisconsin much sooner than environmental routes (bat-to-bat transmission) alone would bring it here, and the spread of the disease would be faster throughout the state after it has arrived.

Ecological & Cave Ecosystem. 'No action' could lead to an earlier introduction of WNS into Wisconsin's caves. Decontamination has only a potential positive effect on a cave while no action can only lead to a negative outcome or more rapid spread of WNS.

Socio-economic. 'No action' would place no requirement for decontamination so there would be no financial or time burden on individuals involved with cave and/or bat research, recreation or rehabilitation. Because decontamination procedures are relatively simple and inexpensive, albeit

potentially time consuming, no action may be perceived by the public and nationwide bat researchers as negligence when actions to protect the WNS status of Wisconsin can be taken.

Partial Decontamination. Under the 'partial decontamination' alternative, not all avenues of decontamination would be required. Decontamination is an effort to minimize risk or human transmission; any compromise in this approach results in a higher risk of human transmission.

Disease Control. *Geomyces destructans* conidia can easily go undetected on clothing or gear, especially from an infected sight where white-nose syndrome has not yet been observed. By requiring only partial decontamination, whether it is certain items of equipment or times when decontamination is required, there is still an elevated risk, relative to full decontamination, that inadvertent anthropogenic spread of the fungus can occur. The risk that human transfer of the fungus could occur reduces the disease control effort of any decontamination procedures.

Ecological & Cave Ecosystem. Decontamination has only a potential positive effect on a cave. Partial decontamination benefits the ecosystem when used but when not required leaves caves at risk of WNS introduction, similar to when no action is taken.

Socio-economic. In requiring only partial decontamination some of the burden of decontamination (financial and time) may be alleviated. However, any investment into decontamination is made obsolete if the risk of WNS introduction to Wisconsin is the same as 'no action' with its subsequent consequences.

Additional Preventive Measures Options
The department will work with cave/mine owners to implement one or more of the following preventive measures to meet the goals of the landowner and minimize the spread of *Geomyces destructans*, as part of a department-approved plan:

1. Management of the WNS-associated fungus (*Geomyces destructans*)

Controlling spread of the fungal agent, *Geomyces destructans* is an approach for preventing further spread of WNS into Wisconsin and into new areas of Wisconsin. The fungus *Geomyces destructans* would need to be removed from the cave environment, as well as from the agents potentially carrying it between hibernacula (i.e., humans and bats). A key strategy to control spread of *Geomyces destructans* is to control those agents potentially carrying *Geomyces destructans*, e.g. humans and bats. There is little yet known about the efficacy, and most important, the practical application, of various fungicidal agents or techniques. Although current experimental trials are under way, proven treatments do not currently exist for bats affected by WNS, and nor have vaccines to prevent fungal colonization been developed. Future development of treatments/ vaccines may play an increasingly important role in reducing the disease incidence and mortality, and in recovery of population viability. Tools to manage the WNS–associated fungus are: 1) Fungicide applications to cave environments or bats and 2) Excluding bats from high human-transmission risk caves.

Effects. Under this alternative, rather than trying to prevent the anthropogenic spread of *Geomyces destructans* to caves, a fungicide treatment would be used to eradicate or reduce the fungal load in the cave ecosystem upon its detection to prevent further spread. This option is not available at this time. Premature use of this option could incur negative and counterproductive effects. At present, this option would only be used under a research scenario.

Disease Control. The first step for any disease control program is prevention. Relying on a fungicide treatment for caves ignores any preventative options for disease control, such as steps to prevent anthropogenic transmission of *Geomyces destructans*. With early-detection surveillance for WNS, a fungicide treatment could take place before any living bats disperse from hibernation, thus offering some control on further spread of the disease. With vaccine treatments, it is also possible to offer some control on further spread of the disease. However broad-scale fungicide application in a cave environment would be experimental and efficacy is unknown. Efficacy in unknown, and a bat vaccine for WNS has yet to be created.

Ecological & Cave Ecosystem. Currently there are no fungicide treatments for *Geomyces destructans* that would not affect the cave ecosystem. There are a plethora of native soil fungi, some closely related to *Geomyces destructans*, found within the cave environment that may be impacted by a treatment, and these impacts may have broader and unknown effects on cave ecology. It is unclear exactly how it would change the ecology in the cave but the likely effect is presumed negative since fungicides are often powerful and could potentially affect living creatures in the cave ecosystem.

Socio-economic. Fungicide application may present some risk to humans. Experience with anti-fungal drugs used to treat humans infected with blastomycosis, caused by the soil fungus *Blastomyces dermatitidis*, has revealed side effects including life-threatening effects. Use of fungicides with possible health risks to humans would require management to minimize such risks.

Excluding bats from high human-transmission risk caves. Bat exclusion would reduce likelihood of human-to-bat WNS transmission by encouraging bats to hibernate elsewhere. Bat exclusion would also reduce WNS risk to the statewide population, by minimizing bat-to-bat transfer from high human-traffic sites. Loss of guano would reduce nutrient input to the cave ecosystem. Possible bat mortality, post-exclusion. Reduced disturbance to hibernating bats at high human-traffic sites.

2. Management through Disease Identification and Testing in Bat Populations

Host biology is always a key factor in the occurrence and management of disease. Research to date has shown that *G. destructans* will, for a period of time, co-exist with healthy bats in caves. Therefore, it is worth considering management of bat populations to decrease the transmission of *G. destructans* through a colony, or increase the WNS resistance of individual bats and decrease exposure of healthy members of a colony to the fungus.

Not every bat in a colony will become infected at the same time or even in the same hibernation period. Consequently, reducing the hibernaculum's fungal spore load may improve the chance that non-affected bats will survive through hibernation and reduce the overall fungal impact on the population. Reducing WNS-associated mortality rates at a site will reduce the long-term WNS impact both to that colony and to the statewide population. Tools to manage the disease through disease-identification and testing bat populations are: 1) In selected situations (e.g. small colonies, sole WNS detections in the area [i.e., "jump" site], other key bat hibernacula in the area at risk), removal of bats from the colony for testing, 2) Selective removal of *Geomyces destructans*-infected bats and their immediate neighbors for testing, 3) Mid-winter containment of *Geomyces destructans*-infected bat colonies, 4) Exclusion of bats from *Geomyces destructans*-infected hibernacula.

Effects.

Disease Control. *Geomyces destructans*-infected bats are a risk for movement of the fungus to new sites in the hibernaculum and to nearby hibernacula. Preventing mid-winter movements of affected bats would reduce the spread and impact of WNS. Removing *Geomyces destructans*-infected bats may reduce the load of agent in the affected colony (and thus reduce transmission risk to other bats). Preventing these mid-winter movements of affected bats to clean sites will minimize wintertime disease transmission among nearby hibernacula.

Ecological & Cave Ecosystem. Preventing clean bats from entering infected sites will maintain as many clean sites in Wisconsin for as long as possible. Preventing additional infection and spread will also directly increase bat survival. Maintaining clean sites could have additional benefits for caves, because the full impact of *Geomyces destructans* on cave ecosystems and their biota is unknown.

Socio-economic. Bats provide ecological services to the general public, particularly in terms of insect pest control. Reducing *Geomyces destructans* spread diminishes bat mortality and therefore helps retain bats and their ecological services on the landscape. Identification and testing provides the information to inform ongoing WNS research and management responses. Testing provides data.

3. Management through Environmental Modification

Environmental factors can play a role in the development/mortality impacts of WNS when *Geomyces destructans* infects a cave. Studies show that bats themselves appear to be practicing "environmental modification", e.g. moving to different areas of a cave, once they are WNS-affected. In theory, a cave environment could be modified to be made less suitable for *Geomyces destructans* growth, while still being suitable for bat hibernation. Tools to manage *Geomyces destrucans* through environmental modification are: 1) Modify temperature and humidity through air-flow manipulation to reduce fungal growth, 2) Provide temporary-harbor thermal refugia ("hot boxes") for *Geomyces destructans*-infected bats, 3) Create insulated roosting structures to maintain more stable temperature and humidity near cave/mine entrances, which normally experience high variability, and 4) Reduce roosting opportunities in parts of hibernacula where the microclimate most strongly favors *Geomyces destructans* growth, to encourage bats to roost where conditions are suitable for hibernation but less so for fungal growth.

Effects.

Disease Control. These approaches may not completely eliminate mortality, however they may increase annual WNS survival rates and help retain a larger potential recovery population. Such approaches need proper design and testing before broad application, to ensure that bats respond by seeking suitable roosting alternatives. Research with bat-to-bat transmission of WNS needs to be conducted to determine effectiveness of removal of infected and surrounding individuals. These actions may help identify prevalence and distribution of infected animals within hibernacula, as they relate to environmental conditions.

Ecological & Cave Ecosystem. Temperature and humidity modifications may alter sensitive and generally stable microclimates within cave systems – particularly pristine and generally undisturbed sites. In contrast, man-made mine hibernacula are novel environments that are largely devoid of endemic and sensitive native life forms, and therefore are suitable for such environmental-modification experiments.

Socio-economic. Environmental manipulation in abandoned or active mines could potentially incur initial setup and also long-term operational costs (e.g., installation or modifications of air-flow technology).

4. Management of Human Activities

The USFWS has recommended a moratorium on cave entries, and many federal and state public lands have been closed to human access. In Wisconsin, the USFS has closed abandoned mines on their lands, and a few private landowners have excluded unauthorized human access to their sites. Restriction on human access to caves is an effective disease control method and perhaps the only way to prevent potential human *Geomyces destructans* transmission. Under this option, humans would be restricted from entering caves. Because of the rapidly changing nature of WNS infection and management, cave-access restrictions are likely to be temporary, except where the landowner wishes otherwise.

The decision to limit access to caves or mines is the decision of the property owner. The rule proposes to work with property and business owners to find effective and practical management strategies at each site that both meet the commercial, recreational or other purposes while still slowing the spread of the fungus

The option of physically excluding bats is highly dependent on the unique characteristics of each site and is not an option for many caves. The feasibility of physical exclusion depends on the number and accessibility of entryways, as well as number of bats using the cave or mine. For example, to allow continued human visitation, WDNR physically excluded bats from a single commercially run cave beginning in late fall 2010. This cave deemed suitable for the technique due to the small number of bats hibernating in the cave, and limited number of bat entrances.

Human-facilitated introduction and spread of *Geomyces destructans* is a significant risk that warrants an abundance-of-caution approach. Unlike bat transmission, human transmission is something we can manage, and in fact control of human transmission is one of the most effective preventive actions we can take. Tools to manage human transmission of WNS include: 1) Cave access restrictions for humans or bats, 2) Permit and schedule coordinated research entry to caves, and 3) Require decontamination of equipment, clothing, and gear, or use of dedicated gear for a site.

Effects.

Disease Control. Access restrictions, if implemented without exception, would negatively affect WNS early-detection surveillance efforts and ongoing WNS research. Some level of authorized entry will be needed for WNS surveillance, monitoring, research, and management. Physical exclusion to caves is an effective disease control method to prevent potential for humans to spread *Geomyces destructans*, or to prevent bat exposure to the fungus in a potentially infected cave.

Ecological & Cave Ecosystem. Cave ecosystems can be biologically rich and highly sensitive to disturbance. Similar to the decontamination option, access restrictions will have a positive effect on cave ecology as they limit and prevents human introduction of any foreign fungus, bacteria or virus to the cave ecosystem. Bats themselves contribute to the cave ecosystem with nutrients (i.e nutrient supplement from guano or dead bats) and there are potential negative effects of bat exclusion depending on how integral bats in that site are to the cave nutrient cycle. Through fall

swarming and natural dispersal exploration, bats are potentially familiar with multiple caves throughout the landscape. Excluding bats from a cave before the hibernation period begins is critical to give them time to move to an alternative hibernaculum, and thus bat exclusions are not expected to have a high mortal effect on the bats.

Socio-economic. Cave and mine access for the general public presents a unique educational and recreational opportunity that may be reduced due to cave access restrictions. Caves and mines are integral for the recreation and exploration of cavers and spelunkers who would be negatively impacted by access restrictions, and commercial cave owners would be negatively impacted. Physical exclusions affect commercial caves and mines, active underground mines, private cave and mine owners, recreational cavers, agriculture and forest industries, and conservation organizations. WDNR cost-sharing for installation of bat gates or other physical barriers, cost-sharing for conservation actions, providing cave closure signage and decontamination protocols, and providing locations of caves that may be used for recreational caving activities (where bats are known to have been excluded) will alleviate some concerns and financial burdens of physical exclusion. Agriculture industries, forest industries and conservation organizations would be negatively affected by not attempting to control or slow the spread of WNS.

Permanent access restrictions are unlikely at most sites across the state. Identifying the process for removing or reducing these temporary access restrictions may lessen the impact of these restrictions on user groups.

Analysis of Alternatives to Preventative Measures
No Action
Under the 'no action' alternative there would be no attempt to prevent the introduction or spread of WNS in the state of Wisconsin as a measure of disease control.

Disease Control. 'No action' provides zero control on the transmission or spread of WNS by humans or wildlife. WNS may arrive in the state of Wisconsin much sooner than environmental routes. Under 'no action' bats carrying the fungus are more likely to disperse from the hibernacula and contaminate other individuals and roost sites. No preventative measures would result in a greater rate of increase in *Geomyces destructans* prevalence, more rapid spread of WNS and a quicker regional population collapse.

Ecological & Cave Ecosystem. 'No action' could lead to an earlier introduction of WNS into Wisconsin's caves and possible collapse of the Wisconsin cave bat population. Extirpation of bats from the cave environment removes a potentially important component of the cave ecosystem, as it removes a top predator and the nutrition from bat droppings.

Socio-economic. 'No action' would place no restrictions for cave or mine access and therefore no conflict of interest among cave users, and no financial or time burden on managers and individuals involved with cave and/or bat research, management, or recreation.

Literature Cited

Arnold Air Force Base et al. 2009. White-nose Syndrome cooperative Monitoring and Response Plan for Tennessee.

Blehert, DS, Hicks AC, Behr M, Meteyer CU, Berlowski-Zier BM, Buckles EL, Coleman JTH, Darling SR, Gargas A, Niver R, Okoniewski JC, Rudd RJ, and Stone WB. 2009. Bat white-nose syndrome: An emerging fungal pathogen? Science 323: 227.

Cleveland, C. J., M. Betke, P. Federico, J. D. Frank, T. G. Hallam, J. Horn, J. D. López, Jr., G. F. McCracken, R. A. Medellín, A. Moreno-Valdez, C. G. Sansone, J. K. Westbrook, and T. H. Kunz. 2009. Economic value of the pest control service provided by Brazilian free-tailed bats in south-central Texas. Frontiers of Ecology and the Environment 4:238–243.

Frick WF, Pollock JF, Hicks AC, Langwig KE, Reynolds DS, Turner GG, Butchkoski CM, and Kunz TH. 2010. An Emerging Disease Causes Regional Population Collapse of a Common North American Bat Species. Science 329:679-682.

Gargas A, Trest MT, Christensen M, Volk TJ, and Blehert DS. 2009. *Geomyces destructans* sp. nov. associated with bat white-nose syndrome. *Mycotaxon 108*: 147–154.

Humphrey SR, Cope JB. 1976. Population Ecology of the Little Brown Bat, Myotis lucifugus, in Indiana and North-Central Kentucky. American Society of Mammalogists: Special Publication No. 4.

Kurta A, and Murray SW. 2002. Philopatry and migration of banded Indiana Bats (Myotis Sodalis) and effects of radio transmitters. Journal of Mammalogy, 83(2): 585-589.

Lindner DL, Gargas A, Lorch JM, Banik MT, Glaeser J, Kunz TH, Blehert DS. 2010. DNA-Based detection of the fungal pathogen *Geomyces destructans* in soils from bat hibernacula. Mycologia. *In Press.*

Martinkova N, Backor P, Bartonicka T, Blazkova P, Cerveny J, et al. 2010. Increasing incidence of Geomyces destructans fungus in bats from the Czech Republic and Slovakia. PLoS ONE 5(11): e13853. Doi:10.1371/journal.pone.0013853.

Sleeman, Jonathan. 2009. Update on White-Nose Syndrome. *USGS Wildlife Health Bulletin*, 2009-03:1-2. http://www.nwhc.usgs.gov/publications/wildlife_health_bulletins/index.jsp

Speakman J.R., P.I. Webb, and P.A. Racey. 1991. Effects of disturbance on the energy expenditure of hibernating bats. The Journal of Applied Ecology. 58:797-813.

Szymanski JA, Runge MC, Parkin MJ, Armstrong M. 2009. White-nose syndrome management: report on structured decision making initiative. Department of the Interior, U.S. Fish and Wildlife Service, Fort Snelling, MN, USA.

Thomas, D.W., M. Dorais, and JM. Bergeron. 1990 Winter energy budgets and cost of arousals for hibernating little brown bats, *Myotis Lucifugus*. Journal of Mammology. 71(3): 475-479

Turner GG, Reeder DM. 2009. Update of White Nose Syndrome in Bats, September 2009. Bat Research News 50(3):47-53.

Wibbelt G, Kurth A, Hellmann D, Weishaar M, Barlow A, Veith M, Pruger J, Gorfol T, Grosche L, Bontadina F, Zophel U, Seidl H-P, CCryan PM, and Blehert DS. 2010. White-nose syndrome fungus (Geomyces destructans) in bats, Europe. Emerging Infectious Diseases 16(8):1237-1242.

Wobeser GA. 2006. Essentials of disease in Wild Animals. Blackwell Publishing.

Appendices

Appendix A. USFWS Cave Advisory March 26, 2009.
http://www.fws.gov/WhiteNoseSyndrome/caveadvisory.html

Appendix B – A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats. Draft 21 October 2010.
http://www.fws.gov/WhiteNoseSyndrome/pdf/WNSNational%20Plan_DRAFT_10.21.2010.pdf

Appendix C. Disinfection Protocol for Bat Field Research/Monitoring U.S. Fish and Wildlife Service June 2009.
http://www.fws.gov/northeast/whitenose/FINALDisinfectionProtocolforBatFieldResearchJune2009.pdf

Appendix D. White-Nose Syndrome Decontamination Protocol (v.3) USFWS – Draft 7.31.2010
http://www.fws.gov/whitenosesyndrome/pdf/WNS1pageDecontaminationProtocol_073110.pdf

Appendix E. Supporting Decontamination Document for Cavers (WNS Decontamination Supplement 1 of 2) USFWS. Draft July 2010.
http://www.fws.gov/whitenosesyndrome/pdf/Supplement1of2_WNSDeconforCaversJuly2010.pdf

Appendix F. Alabama White-Nose Syndrome Management Plan. Alabama bat working Group, June 2, 2010. http://goodworkscomm.com/bats/AL_WNS_Management_Plan_Final_6-2010.pdf

Appendix G. Georgia White-nose Syndrome (WNS) Response Plan. Last revised July 19, 2010.
http://goodworkscomm.com/bats/AL_WNS_Management_Plan_Final_6-2010.pdf

Appendix H. Bat Handling/Disinfection Protocol for Summer Bat Field Studies in Kentucky. May 1, 2009. http://fw.ky.gov/pdf/batdisinfection.pdf

Appendix I. White Nose Syndrome Action Plan, Missouri Department of Conservation 4-12-2010. http://www.fws.gov/whitenosesyndrome/pdf/MissouriDCStateResponsePlan2010.pdf

Appendix J. Final White-nose Syndrome Interagency Response Plan for New Mexico. November 5, 2010. 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