

Bat “White-nose Syndrome” Surveillance Plan & Protocols

2011-2012

December 2011

This bat “white-nose syndrome” surveillance plan outlines work to be conducted by Colorado Parks & Wildlife (CPW) employees working in cooperation with other agencies for winter 2011-2012. This plan will be updated annually, though updates could be more frequent in response to new information.

Introduction

Since first being observed in 2006, “white-nose syndrome” (WNS) has infected at least 9 species of hibernating bats in North America and has rapidly spread to 19 states and 4 Canadian provinces. In 2010, WNS was documented in northwest Oklahoma, approximately 200 miles from Colorado.

Surveillance efforts proposed for Colorado are intended to:

1. detect the presence of WNS in Colorado as early as possible;
2. minimize the potential for surveillance activities to contribute to the spread of WNS or adversely impact bats through disturbance;
3. gather baseline data on bats and their habitats, especially the locations of hibernacula in Eastern Colorado.

In all surveillance activities, disturbance of bats in hibernacula will be kept to a minimum. Arousing bats causes unnecessary depletion of fat reserves which may decrease survival and reproductive success.

The CPW has collected data on native bat species, including the location of roost sites and hibernacula, since 1990. Much of this information has been collected as part of the Bats/Inactive Mines Project (BIMP), which evaluates an average of 300 mine openings for potential bat use each year. However, many of the sites identified during BIMP evaluations are not routinely revisited after gate installation resulting in a lack of multi-year data from these sites. CPW also lacks information on cave and other man-made structures that are providing important habitat for bats in the state. These ‘data gaps’ create problems when trying to develop a statistically based surveillance plan and are the main focus of work to be done in 2011/2012. The work proposed for this winter is a continuation of the surveillance done in the winter of 2010/2011, with lessons learned during that first year being applied to this plan.

Risk Factor Identification

Despite the limited data on native bats in Colorado, qualitative factors that increase the risk of hibernacula containing infected bats have been developed to guide surveillance efforts until more detailed information can be collected. The following risk factors were used to develop the list of mines and caves for surveys during the hibernation period of December 2011 through March 2012. (Appendix A, Figure 1)

1. Proximity to the closest suspected WNS infected bat population (NW Oklahoma) - This factor addresses the threat of WNS transmission by bats using the suspected WNS positive site in NW

Oklahoma during a portion of the year and coming into contact with bats that spend their time in Colorado. It should be recognized that little is known about bat habitat in the southeast portion of Colorado due to the large extent of private and military lands in that region. All sites on the eastern slope of the Rocky Mountains to the eastern border of Colorado are priority sites.

2. Risk to bat species known to occupy the site - The little brown myotis (*Myotis lucifugus*) is susceptible to WNS, as identified by die-offs at infected sites in the eastern US, and is believed to be at risk of infection if WNS spreads to Colorado. Because little is known about the hibernation activities of the little brown myotis in Colorado, the sampling frame of potential sites is based on the species for which the CPW has the most information, the Townsend's big eared bat (*Corynorhinus townsendii*). Townsend's big eared bat is a species of special concern and is known to occupy the largest number of mines in Colorado
3. Number of bat species in the hibernacula – Mixed species of bats in hibernacula increases the risk of transmission and spread of the WNS fungus.
4. Known or suspected human visitation to the site – Human visitation to caves and mines is a concern due to the increased possibility of spreading WNS fungus on clothing and equipment. Decontamination protocols have been developed but their effectiveness is still being studied. Mines which have been gated are considered at lower risk unless the gates have been breached.
5. Number of bats in the hibernacula – Spread of WNS fungus in large congregations of hibernating bats poses the greatest risk to overall bat population numbers. To date, Townsend's big-eared bats are found to hibernate most often and in the largest groups in mines and caves of any bat species in Colorado.
6. Site accessibility - Some sites will be added or removed from the identified list based on accessibility of the site due to snow conditions, security aspects, personnel safety or landowner restrictions on private or public lands.

Survey Sites

Based on the factors listed above, over 300 sites had been identified for potential surveys in 2011. (Appendix A, Figure 1) CPW biologists identified sites which they could safely access during the winter and were secure enough to deploy monitoring equipment. This information better defines the sites that will need to be visited or monitored in 2011/2012, including redeploying acoustic monitoring equipment at many of the same sites to gather multi-year data.

As the eastern portion of Colorado is at risk for WNS spread, caves and mines east of the Continental Divide are once again considered high-priority for surveillance. Also, some sites that were accessible during or surveyed prior to the National Speleological Society Conference held in Glenwood Springs in July 2011 are being considered high-priority for continued surveillance. Any site with reports of unusual bat activity during the winter months will become part of the surveillance plan.

Based on the risk factors and evaluations described above, survey sites will once again be separated into three tiers of survey effort in 2011/2012 – internal monitoring, acoustic monitoring, or external monitoring. Some sites may receive a combination of efforts.

Tier 1 sites will receive internal monitoring. Survey activities may consist of entering the cave or mine to gather presence/absence data on bats, estimate number and species of bats, collect temperature data, deploy a data logger, and gather soil samples. Internal survey data will be collected only when activities do not pose a threat to hibernating bats. Time spent in the cave or mine will be kept to an absolute minimum. Data loggers may be deployed and downloaded during any season and are intended to gather long term data on temperature and relative humidity. Sites will be designated Tier 1 if they have internal access (door in existing mine gate), are to receive an internal survey for another project, or are high priority based on another factor. To minimize disturbance to roosting colonies, known hibernacula will only be entered if the last internal winter survey was more than 3 years ago.

Tier 2 sites will receive acoustic monitoring. Survey activities consist of surveying the cave or mine opening for presence of bats and deploying an acoustic detector at the cave or mine opening. Most sites that were monitored with acoustic equipment last winter will be monitored again this winter so as to collect multi-year baseline data. Additional sites will be designated Tier 2 if they do not have internal access (no door in existing mine gate) or are externally secure enough to deploy acoustic detectors without threat of theft or vandalism. There will be up to 40 acoustic detectors deployed in 2011/12.

Tier 3 sites will receive external monitoring only. Survey activities consist of surveying the cave or mine opening for presence of bats and signs of bat mortalities. Sites will be designated Tier 3 if they do not have internal access (no door in existing mine gate) and are not secure enough to deploy acoustic detectors. Tier 3 surveys will be low priority of staff time but efforts will be made to implement these surveys using other agency personnel and/or volunteers.

General Survey Protocols

These protocols will be implemented from December 2011 –November 2012. Acoustic monitoring will only occur from December 2011 – March 2012, as it is intended to determine baseline levels of bat activity at winter roost sites. It is not expected that WNS related bat mortalities will be detected at sites after May though deployment of data loggers and other survey activities will determine work needs for the following winter (2012-2013). For all levels of survey work described in this plan, personnel will ensure their safety by using appropriate personal protective equipment and taking standard safety measures. Standard equipment needed for these surveys is listed in Appendix E.

Tier 1 sites (Internal Surveys): The most recent United States Fish and Wildlife Service (USFWS) guidelines for disinfecting clothing and equipment for WNS will be used in all instances when mines/caves are entered. (Appendix D) All data will be recorded on the WNS Survey Data Sheet (Appendix C). *To reduce adverse impacts to hibernating bats, time spent in a cave or mine will be kept to an absolute minimum.* In all instances where dead or moribund bats are found, Tina Jackson and/or Bob Davies will be notified as soon as possible.

Upon arrival at the cave or mine, CPW personnel will:

1. Search the area around the cave or mine opening for signs of bat use, including living or dead bats. If any signs or bats are found, record the species and numbers. All dead or moribund bats will be handled as described in Appendix F. Details of the mortalities must be documented on the WNS Survey Data Sheet.

Upon entering the cave or mine, CPW personnel will:

1. Document the presence/absence of bats, identify what species are present, count or estimate the number of bats present, and look for any obvious WNS signs on bats. All dead or moribund bats will be handled as described in Appendix F. Details of the mortalities must be documented on the WNS Survey Data Sheet. *Live bats are not to be handled or disturbed for the collection of these data.*
2. Collect microclimate data such as temperature and relative humidity.
3. Deploy data loggers in appropriate and/or diverse locations within the site. Examples of locations to consider are known or observed bat roosts or where the internal site is obviously different (i.e. wetter, warmer, etc.). Most sites will receive more than one data logger due to site characteristics. Document the location of data loggers so other personnel will be able to relocate for downloading.
4. Take photographs of bats observed. *Bats are not to be handled or disturbed for the collection of this data.*
5. Collect soil samples by scooping soil, bat guano, and/or small bat remains into the provided sample bag using a sterile tongue depressor. (Appendix B) *Soil samples will only be taken in sites where the additional time to collect will not adversely impact any bats present.* If collection of soil samples will adversely impact hibernating bats (due to excessive time, noise, etc.) the site should be recorded or marked so as to be relocated after bats have left the hibernacula.
6. Evaluate and document the need for additional types or levels of monitoring at the site.

Tier 2 sites (Acoustic Surveys): Acoustic monitoring will occur outside the mine or cave, in most cases. If the mine or cave is to be entered for deployment of acoustic detectors, the most recent USFWS guidelines for disinfecting clothing and equipment for WNS will be used. (Appendix D) All data will be recorded on the WNS Survey Data Sheet.

Upon arrival at the cave or mine, CPW personnel will:

1. Search the area around the cave or mine opening for signs of bat use, including living or dead bats. If any signs or bats are found, record the species and numbers. All dead or moribund bats will be handled as described in Appendix F. Details of the mortalities must be documented on the WNS Survey Data Sheet.
2. Deploy the acoustic detector and power supply in a secure location within 30 ft of the opening. Acoustic detectors are being deployed for long periods of time (up to 5 months) so the sites should have limited human disturbance and minimal rodent sign. Document the location of the

detector, microphone, and power supply. Refer to the 2011 WNS Acoustic Monitoring Protocols (Appendix G) for information on settings and deployment locations.

3. Evaluate and document the need for additional types or levels of monitoring at the site.

Tier 3 sites (External Surveys): External surveys will occur at as many other locations as time and personnel allow. These sites will not be entered. All data will be recorded on the WNS Survey Data Sheet.

Upon arrival at the cave or mine, CPW personnel or volunteers will:

1. Search the area around the cave or mine opening for signs of bat use, including living or dead bats. If any signs or bats are found, record the species and numbers. All dead or moribund bats will be handled as described in Appendix F. Details of the mortalities must be documented on the WNS Survey Data Sheet.
2. Evaluate and document the need for additional types or levels of monitoring at the site.

After leaving any survey site (Tier 1, 2 or 3), data sheets, photographs, soil samples, and any other data collected will be sent to the Wildlife Health Section and/or the Bat Conservation Coordinator. Biologists are encouraged to keep a copy of all data sheets, photographs, and other data collected for their own records.

Summer and Fall Specific Surveys: From April – October 2012, CPW personnel will undertake survey efforts in addition to those outlined above. These will include:

1. All mines visited during BIMP evaluations will also be surveyed under these protocols. For BIMP site evaluations that are internal, Tier 1 protocols will be followed. When making gating recommendations under BIMP, biologists will consider the inclusion of access doors on gates to allow for future internal WNS surveillance..
2. Determine any additional cave or mine sites that will warrant future survey efforts using the current risk factors. Visit these sites to evaluate and document the level of monitoring to be recommended.
3. Work with the recreational caving community, USFS and BLM to locate and survey caves in Colorado.

Other Surveillance Work

In conjunction with the active surveillance efforts described above, the CPW will undertake the following surveillance activities:

Internal Information - Inform all CPW personnel, especially Customer Service Representatives and District Wildlife Managers, about WNS and the importance of following up on any reports of winter bat activity or mortalities. Information will also be provided on who should be notified of bat sightings and how to collect mortalities, if found.

Public Information - There will continue to be periodic news releases informing the public about WNS and bats. This information will include general information about both bats and WNS, why it is an important concern, and how to contact CPW to report sightings. The public will be asked to notify the CPW of any bat activity observed in the February/March/April time period, or any bat mortalities, especially near mines/caves. These press releases will stress the importance of additional information in Eastern Colorado. All reports will be investigated and any reported or discovered hibernacula will become part of the surveillance effort.

Stakeholder Coordination – CPW will coordinate directly with the recreational caving community, wildlife rehabilitators, bat researchers, and other stakeholder groups with more direct access to bats or their habitat. This coordination will include general information about bats and WNS (as described above) as well as details on disinfection protocols, where to report sightings, and progress on CPW planning and survey efforts. CPW will also work with the USFS and BLM to distribute information on cave closures throughout the state. All individuals working directly with bats through either a Wildlife Rehabilitator license or a Scientific Collection permit will be required to notify the CPW of any bat mortalities or the observation of any abnormal activities.

Future Efforts to Increase Surveillance Effectiveness and Efficiency

Given the gaps in knowledge of bat biology, habitats and distribution in Colorado, it is recommended that efforts be started early in 2012 to establish research and field work that will provide the necessary information to increase the effectiveness and efficiency of WNS surveillance efforts. Several knowledge gaps that need to be addressed to help facilitate WNS surveillance efforts include:

1. Identify additional bat hibernation sites to better understand the spatial location and distribution of such sites in Colorado. It is particularly important to identify sites in the southeastern portion of the state, sites used by *Myotis* spp., and sites in cave habitats.
2. Investigate other surveillance approaches which do not involve entering hibernacula during the hibernation period.
3. Determine the environmental characteristics of hibernacula in Colorado including non-mine/cave sites.
4. Identify the most likely corridors of WNS spread into Colorado by studying bat habitat, migration, and foraging patterns, as well as possible locations of human caused introduction.

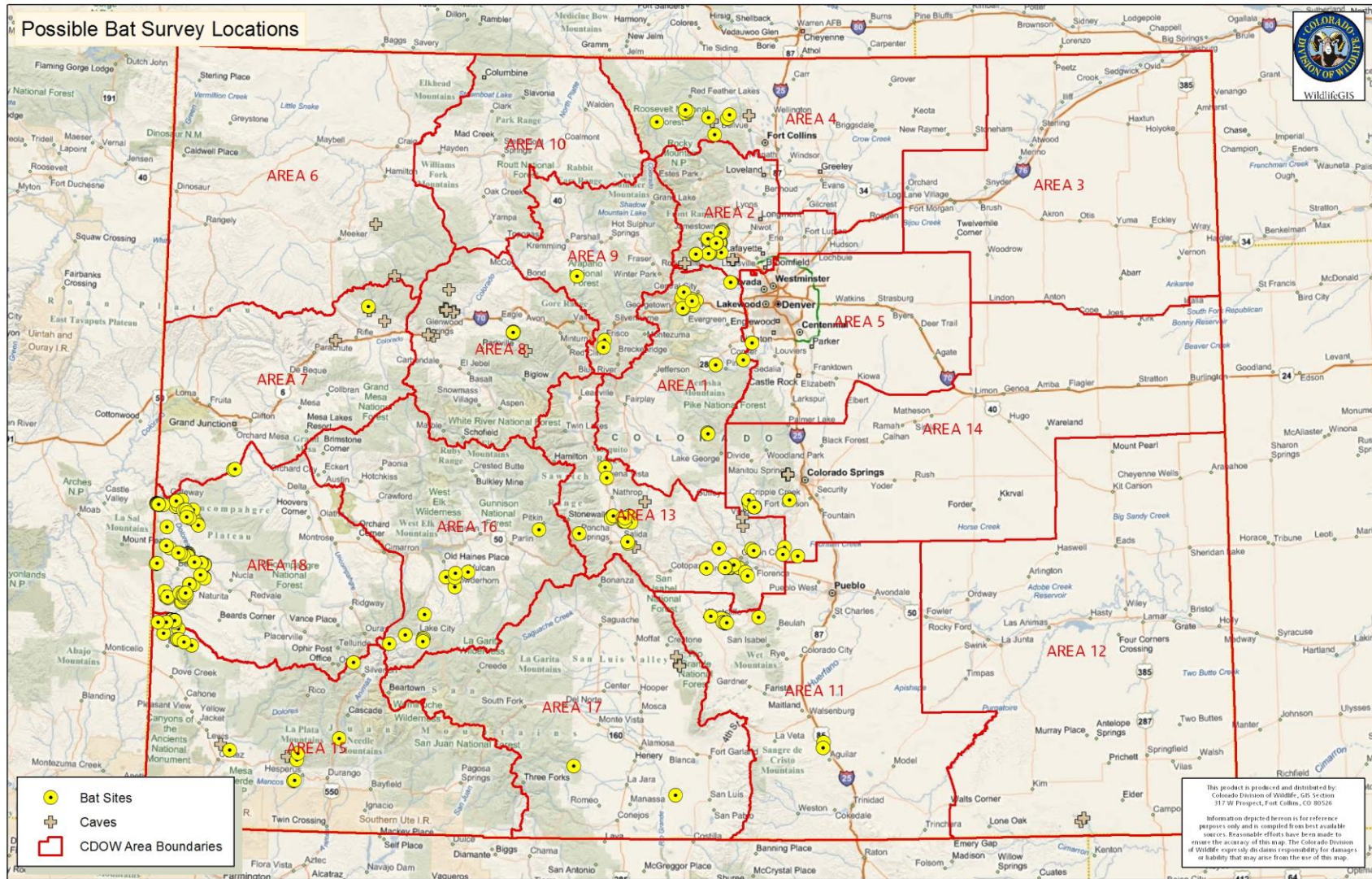
Reporting

Winter WNS surveillance efforts will be summarized and a brief report completed by June 1, 2012

Summer WNS survey efforts will be summarized and a brief report completed by November 1, 2012

Surveillance plans for 2013 will be completed by December 1, 2012

Figure 1. Potential Statewide WNS Survey Sites associated with the Bats/Inactive Mines data, Winter 2011-2012



APPENDIX A

Site Lists

Table 1. Planned Acoustic Sites

Site	ID Number	County	Region	Gate	Year	Type
JEFFCO JCOS6 (Ralston Creek)	LJEFF0506	JEFFERSON	NE	YES	2005	COMX
Miner's Candle #6			NE			
WOODPECKER GULCH 208	XWOOD0008	CLEARCREEK	NE	YES	2000	ADIT
Anvil Points Mine			NW			
ANVIL POINTS MUD CAVE	BAPCA0016	GARFIELD	NW			CAVE
COPPER RIVET MINES	BCOPP0101	MESA	NW	YES	2001	COMX
HUBBARD WEST	BLUMS9901	MESA	NW	YES	1999	COMX
McClane Mine		Garfield	NW			
SPRING CAVE	FSCCA0001	RIO BLANCO	NW			CAVE
UP12	BUNWP9202	MESA	NW	YES	1992	ADIT
5 SISTERS 6	DFIVE0406	FREMONT	SE		2004	ADIT
BUNKER HILL 9	DBUHI0709	LAS ANIMAS	SE		2007	DECLINE
GB 504A (Gold Bond)	DGLBD9401	TELLER	SE		1994	STOPE
KANKAKEE K-2	BKANK0602	CUSTER	SE		2007	ADIT
PARKDALE	DPARK9201	FREMONT	SE		1992	ADIT
RAILROAD GULCH 111	XRAIL0411	CHAFFEE	SE		2004	ADIT
SKULL CANYON MINE	PSKUL0001	BACA	SE			MINE
STONE CITY 45-5	MSTON0817	PUEBLO	SE		2008	COMPLEX
TURTLE ROCK TR4A1	FTURO0704	CHAFFEE	SE		2007	COMPLEX
CRESTONE 100	DCRES0200	SAGUACHE	SW	YES	2002	ADIT
GEORGETTO MINE	BGETO0201	SAN MIGUEL	SW	YES	2003	COMX
HAWK 8A P8A	BHAWK0008	SAN MIGUEL	SW	YES	2000	COMX
PARADOX 1292A2	BPARA0120	MONTROSE	SW	YES	2001	DECLINE
RED ARROW MINE	PREDA0001	MONTEZUMA	SW			MINE
Potential (new detectors)						
Miner's Candle 29			NE			
FALL RIVER 21	DFALL9721	CLEAR CRK	NE	SLOT	1997	ADIT
FALL RIVER 3	DFALL9703	CLEAR CRK	NE	SLOT	1997	ADIT
JEFFCO RR-4	LJEFF0514	JEFFERSON	NE	YES	2005	ADIT
RED ELEPHANT 17	LREDE0217	CLEAR CREE	NE		2002	ADIT
UPPER VIRGINIA CANYON 23	DVIRG0323	CLEARCREEK	NE	LADD	2003	ADIT
CAVE OF THE WINDS	PCOTW0022	EL PASO	SE			CAVE
PORCUPINE CAVE	PPOCA0041	PARK	SE			CAVE
Williams Canyon			SE			Cave
Orient Mine			SW			

Table 2. Planned Data Logger Sites

Site	ID Number	County	Regio	Gate	Year	Type
Cascade 118	DCASC9618	Clear Crk	NE	BHSL1	1996	Adit
FALL RIVER 3	DFALL9703	CLEAR CRK	NE	SLOT	1997	ADIT
FALL RIVER 21	DFALL9721	CLEAR CRK	NE	SLOT	1997	ADIT
GOLDEN AGE CG1	FGACG9401	BOULDER	NE	YES	1994	ADIT
JeffCo (new site)		Jefferson	NE			
LANDS END S22	DLAND0915	BOULDER	NE	YES	2009	ADIT
Mill Creek 129	DMILL9929	Clear Creek	NE	Slot	1999	Adit
Miner's Candle #11		Clear Creek	NE			1 logger
Miner's Candle 29			NE			
Miner's Candle #6		Clear Creek	NE			5 loggers
RED ELEPHANT 17	LREDE0217	CLEAR CREE	NE		2002	ADIT
WOODPECKER GULCH	DWOOD004	CLEARCREEK	NE	SLOT	2000	ADIT
ANVIL POINTS MUD CAVE	BAPCA0016	GARFIELD	NW			CAVE
COPPER RIVET MINES	BCOPP0101	MESA	NW	YES	2001	COMX
GROANING CAVE	FGRCA0009	GARFIELD	NW			CAVE
HUBBARD WEST	BLUMS9901	MESA	NW	UNK	1999	COMX
HUBBARDS CAVE	FHCCA0002	GARFIELD	NW			CAVE
SPRING CAVE	FSCCA0001	RIO BLANCO	NW			CAVE
Canyon Cavern		Fremont	SE			Cave
GB 504A (Gold Bond)	DGLBD9401	TELLER	SE		1994	STOPE
TURTLE ROCK TR4A1	FTURO0704	CHAFFEE	SE		2007	COMPLE
CRESTONE 100	DCRES0200	SAGUACHE	SW	YES	2002	7 loggers
GEORGETTO MINE	BGETO0201	SAN MIGUEL	SW	YES	2003	COMX
HAWK 8A P8A	BHAWK000	SAN MIGUEL	SW	YES	2000	COMX
PARADOX 1292A2	BPARA0120	MONTROSE	SW	YES	2001	DECLINE
RED ARROW MINE	PREDA0001	MONTEZUMA	SW			MINE
ROOSEVELT MINE	FROSE9101	GUNNISON	SW	WIN	1991	ADIT
SC22 TERRACE	DSPAR9308	CONEJOS	SW	YES	1993	1 logger
Wild Cherry Mine	FWILD0001	Saguache	SW	Yes		1 logger

Table 3. Priority Monitoring Sites (not being monitored by CPW, yellow highlight = highest priority)

Site	ID Number	County	Region	Gate	Year	Type
BOULDER MOUNTAIN J3	LBOMT9316	BOULDER	NE	YES	1993	ADIT
BOULDER MOUNTAIN	FBOMT9325	BOULDER	NE	YES	1993	ADIT
BRD EAST HESSIE FALLS	FBRDS9301	BOULDER	NE			MINE
C PROHIBITION MT	FREDF9308	LARIMER	NE	YES	1993	ADIT

Site	ID Number	County	Region	Gate	Year	Type
CARIBOU RANCH 13	LCARIO213	BOULDER	NE	YES	2002	ADIT
CARIBOU RANCH 14	LCARIO214	BOULDER	NE	YES	2002	ADIT
CARIBOU RANCH 15	LCARIO215	BOULDER	NE	YES	2002	ADIT
CHRISTIANS CRACK CAVE	FCCCA0038	LARIMER	NE			CAVE
CROSIER MT MINE	LMINE0209	LARIMER	NE			MINE
DUTCH FLATS	FREDF9401	LARIMER	NE	WIN	1994	ADIT
GOLDEN AGE CG20	FGACG9314	BOULDER	NE	CULVSLOT	1993	ADIT
GOLDEN AGE S 30/31	DGAEM9416	BOULDER	NE	YES	1994	COMX
GOLDEN AGE S37	DGAEM9404	BOULDER	NE	YES	1994	ADIT
GOLDEN AGE S43	DGAEM9402	BOULDER	NE	BHEAD	1994	ADIT
GOLDEN AGE TT105	FGACG9533	BOULDER	NE	YES	1995	ADIT
HEWLETT GULCH	FREDF9402	LARIMER	NE	YES	1994	ADIT
KREMERS CAVE	PKCCA0037	LARIMER	NE			CAVE
LANDS END S32	DLAND0925	BOULDER	NE	YES	2009	ADIT
LEFTHAND CG3	FGACG9412	BOULDER	NE	YES	1994	ADIT
LEFTHAND CG8	FGACG9411	BOULDER	NE	LADD	1994	ADIT
MANHATTAN BOSTON	FMHAT9830	LARIMER	NE	YES	1998	ADIT
MANHATTAN POUFRE	FMHAT9832	LARIMER	NE	YES	1998	ADIT
MANHATTAN SM1	FMHAT9801	LARIMER	NE	YES	1998	ADIT
MANHATTAN SM15	FMHAT9815	LARIMER	NE	YES	1998	ADIT
MANHATTAN SM3	FMHAT9803	LARIMER	NE	YES	1998	ADIT
MANHATTAN SM4	FMHAT9804	LARIMER	NE	SLOT	1998	ADIT
OWL CANYON CAVE	POWCA0031	LARIMER	NE			CAVE
PEEWINK 102	FLAKE9612	BOULDER	NE	YES	1996	ADIT
PEEWINK 105	FLAKE9605	BOULDER	NE	YES	1996	STOP
PEEWINK 108	FLAKE9608	BOULDER	NE	YES	1996	STOP
PEEWINK 109	FLAKE9601	BOULDER	NE	YES	1996	ADIT
PEEWINK MT 02	FLAKE0201	BOULDER	NE	YES	2002	ADIT
SPRING GULCH SG5	FGASG9505	BOULDER	NE	YES	1995	COMX
STANLEY S2	DSTAN0202	CLEAR CREE	NE		2002	COMX
STANLEY S31	DSTAN0231	CLEAR CREE	NE	YES	2002	ADIT
AMETHYST QUEEN 9	BAMQN9502	MESA	NW	YES	1995	ADIT
BLUE CREEK 39 A1	BBLUE9913	MESA	NW	YES	1999	ADIT
BLUE CREEK 41 A1	BBLUE9921	MESA	NW	YES	1999	ADIT
BUTTERFLY MINE 102	FMINE0018	RIO BLANCO	NW			MINE
CALAMITY FP2	BOUTL9741	MESA	NW	YES	1997	ADIT
CATTLEGUARD CAVE	BCGCA0028	GARFELD	NW			CAVE
CENTURY EAST	BLUMS0038	MESA	NW	YES	2000	COMX
CENTURY WEST	BLUMS0037	MESA	NW	YES	2000	COMX
COPPER MOUNTAIN 10	XCOPP0510	SUMMIT	NW	UNK	2005	ADIT
COPPER MOUNTAIN 8	XCOPP0508	SUMMIT	NW	UNK	2005	ADIT

Site	ID Number	County	Region	Gate	Year	Type
ELIZABETH 49A1	BELIZ0001	MESA	NW	YES	2000	ADIT
FIXIN TO DIE CAVE	FFXCA0008	GARFIELD	NW			CAVE
FULFORD CAVE	FFUCA0007	EAGLE	NW			CAVE
GLENWOOD CAVERNS	PGLCA0025	GARFIELD	NW			CAVE
GREEN MOUNTAIN 1	FGREE0101	SUMMIT	NW	YES	2001	ADIT
HONKY CAVE	FHKCA0018	GARFIELD	NW			CAVE
HOUR GLASS CAVE	FHRCA0033		NW			CAVE
LA SAL FAN	BLUMS9906	MESA	NW	YES	1999	COMX
LA SUNDER CAVE	BLSCA0026	GARFIELD	NW			CAVE
LADY BELLE 1	BLADY9901	EAGLE	NW	YES	1999	ADIT
LADY BELLE 4	BLADY9904	EAGLE	NW	CULVLADD	1999	ADIT
LADY BELLE 5	BLADY0205	EAGLE	NW	CUPP?	2002	ADIT
LADY BELLE 6	BLADY9805	EAGLE	NW	YES	1998	ADIT
LUMSDEN 86	BLUMS0034	MESA	NW	YES	2000	COMX
OUTLAW MESA 31	BOUTL9702	MESA	NW	YES	1997	ADIT
OUTLAW MESA DIXIE 2	BOUTL9851	MESA	NW	YES	1998	ADIT
OUTLAW MESA 15	BOUTL9847	MESA	NW	YES	1998	ADIT
OUTLAW MESA 34 MAIN	BOUTL9856	MESA	NW	YES	1998	ADIT
OUTLAW MESA 4	BOUTL9848	MESA	NW	YES	1998	ADIT
OUTLAW MESA 59	BOUTL9711	MESA	NW	CULD	1997	ADIT
OUTLAW MESA 61 D2	BOUTL9849	MESA	NW		1998	DECL
OUTLAW MESA 65	BOUTL9719	MESA	NW	YES	1997	DECLINE
OUTLAW MESA 67A1	BOUTL9728	MESA	NW	YES	1997	ADIT
OUTLAW MESA 73A2	BOUTL9845	MESA	NW	YES	1998	ADIT
PACK RAT MAIN	BLUMS9903	MESA	NW	YES	1999	COMX
POWDERHORN 12	DPOWD0312	GUNNISON	NW	YES	2003	ADIT
PREMONITION CAVE	FPRCA0029	GARFIELD	NW			CAVE
RAJAH 49-2 FAN	BLUMS9917	MESA	NW	YES	1999	COMX
RAJAH 49-5	BLUMS9920	MESA	NW	YES	1999	COMX
RAJAH POINT 2	BLUMS9908	MESA	NW	PEND	1999	COMX
RIFLE GAP CAVE 1	SRGCA0012	GARFIELD	NW			CAVE
SPINSTER CAVE	BSPCA0040	GARFIELD	NW			CAVE
SUNSHINE 2	BSUNS9802	GARFIELD	NW	YES	1998	COMX
SUNSHINE 4	BSUNS9804	GARFIELD	NW	YES	1998	COMX
SWEETWATER INDIAN CAVE	FSWCA0027	GARFIELD	NW			CAVE
TEAKEE MINE	PMINE0105	GARFIELD	NW			MINE
TENDERFOOT MESA 3	BDPTM9513	MESA	NW	YES	1995	STOP
TENDERFOOT MESA 5A	BDPTM9506	MESA	NW	YES	1995	STOP
TENDERFOOT MESA 5B	BDPTM9507	MESA	NW	YES	1995	STOP
TENDERFOOT MESA14D	BDPTM9504	MESA	NW	YES	1995	STOP
THURSDAY MORNING	FTMCA0015	GARFIELD	NW			CAVE

Site	ID Number	County	Region	Gate	Year	Type
CAVE						
WEDNESDAY AFTERNOON CAVE	FWEDS0120		NW			CAVE
YELLOWBIRD 46A1	BYELL0003	MESA	NW	YES	2000	COMX
YELLOWBIRD 46A4	BYELL0002	MESA	NW	YES	2000	COMX
YELLOWBIRD 46A5	BYELL0001	MESA	NW	YES	2000	COMX
BAT CAVE	UBATC0044	FREMONT	SE			CAVE
BOOMER 103A	DBOOM9701	PARK	SE	UNK	1997	ADIT
BOOMER 103B	DBOOM9702	PARK	SE	SLOT	1997	ADIT
BOOMER 103C	DBOOM9703	PARK	SE	AIR?	1997	ADIT
BOOMER 103D	DBOOM9706	PARK	SE	UNK	1997	ADIT
BUENA VISTA 4	BBUEN0804	CHAFFEE	SE		2008	ADIT
BUNKER HILL 10	DBUHI0710	LAS ANIMAS	SE		2007	ADIT
BUNKER HILL 3	DBUHI0703	HUERFANO	SE		2007	ADIT
CLIFF HANGER CAVE	PCLIF0021	EL PASO	SE			CAVE
CM458	DCITY9301	TELLER	SE	SLOT	1993	ADIT
CM460	DCITY9302	TELLER	SE	SLOT	1993	ADIT
CM462	DCITY9308	TELLER	SE	BREECH	1993	ADIT
CM465	DCITY9305	TELLER	SE		1993	ADIT
DAKOTA 1	BDAKO0401	FREMONT	SE		2004	ADIT
DAKOTA 5	DDAKO0405	FREMONT	SE		2004	ADIT
DAKOTA 8	DDAKO0408	FREMONT	SE		2004	ADIT/CO
DAWSON 1	DDAWS0601	FREMONT	SE		2007	ADIT
DAWSON 3	DDAWS0603	FREMONT	SE		2007	COMPLEX
DAWSON 4	DDAWS0604	FREMONT	SE		2007	ADIT
DAWSON 5	DDAWS0605	FREMONT	SE		2007	COMPLEX
DUTCH FLAT 122	XDUTC0322	CUSTER	SE		2003	ADIT
DUTCH FLAT123	XDUTC0323	CUSTER	SE		2003	ADIT
FLY CAVE	PFYCA0004	FREMONT	SE			CAVE
GB 504A	DGLBD9401	TELLER	SE	MODS	1994	STOPE
GB 537	DGLBD9411	TELLER	SE		1994	ADIT
GOLDEN DUCK CAVE	PGDCA0020	EL PASO	SE			CAVE
GRAPE CREEK GC-1A	LGRAP0501	FREMONT	SE		2005	COMX
GRAPE CREEK GC-2	LGRAP0504	FREMONT	SE		2005	COMX
GRAPE CREEK GC-3	LGRAP0505	FREMONT	SE		2005	COMX
HECLA JUNCTION 135	BHCLA9810	CHAFFEE	SE		1998	ADIT
HECLA JUNCTION 142 A	BHCLA9808	CHAFFEE	SE		1998	ADIT
HECLA JUNCTION 189	BHCLA9806	CHAFFEE	SE		1998	ADIT
KANKAKEE 12	BKANK0712	CUSTER	SE		2007	ADIT
KANKAKEE K-1	BKANK0601	CUSTER	SE		2007	ADIT
MYOTIS CAVE	PMYOC0019	EL PASO	SE			CAVE
NARROWS CAVE	PCWCA0017	EL PASO	SE			CAVE

Site	ID Number	County	Region	Gate	Year	Type
NATURAL BRIDGES CAVE	PNBCA0032	EL PASO	SE			CAVE
RAILROAD GULCH 107	DRAIL0407	CHAFFEE	SE		2004	ADIT
RAILROAD GULCH 109	DRAIL0409	CHAFFEE	SE		2004	ADIT
RAILROAD GULCH 112A	FRAIL0436	CHAFFEE	SE		2004	ADIT
RAILROAD GULCH 113	XRAIL0413	CHAFFEE	SE		2004	ADIT
RAILROAD GULCH 114	FRAIL0414	CHAFFEE	SE		2004	ADIT
REEF 136	FREF0236	CHAFFEE	SE		2002	COMX
ROBINSON 101	DROBI0001	CUSTER	SE		2000	ADIT
ROBINSON 102	BROBI0002	CUSTER	SE		2000	COMX
ROBINSON 124	BROBI0024	CUSTER	SE		2000	ADIT
ROUND MT 40	DRDMT9417	CUSTER	SE		1994	STOPE
SALIDA EAST 101	DLONG9900	CHAFFEE	SE		1999	ADIT
SALIDA EAST 12	FSALE9812	CHAFFEE	SE		1998	TUNNEL
SIGNAL HILL 2	XSIGN0232	TELLER	SE		2002	ADIT
SIGNAL HILL 700E	BSIGN0228	TELLER	SE		2002	ADIT
SIGNAL HILL 708	BSIGN0230	TELLER	SE		2002	ADIT
ST PETERS RRT2A	FSTPE0709	EL PASO	SE		2007	COMPLEX
ST PETERS RRTSB	FSTPE0710	EL PASO	SE		2007	COMPLEX
STONE CITY 41-6	MSTON0806	FREMONT	SE		2008	COMPLEX
STONE CITY 42-9	MSTON0809	FREMONT	SE		2008	ADIT
STONE CITY 45-19	MSTON0824	PUEBLO	SE		2008	COMPLEX
SUNSET CITY SC-2	XSUNS0511	FREMONT	SE		2005	ADIT
SUNSET CITY SC-5	DSUNS0514	FREMONT	SE		2006	ADIT
TAYLOR GULCH 1 GARF	DTAYL9201	CHAFFEE	SE	LADD	1992	ADIT
TEMPLE CANYON 5	BTEMP0505	FREMONT	SE		2005	ADIT/CO
TREASURE GULCH H-3	FTREA0503	CUSTER	SE		2005	ADIT
WILLIAMSBURG COAL	BWILL0102	FREMONT	SE		2001	DECLINE
WILSONS CAVE	PWICA0042	TELLER	SE			CAVE
ALPINE CREEK MINE	FDEAD0701	SAGUACHE	SW			MINE
BULL CANYON 576A6	BEABU0731	MONTROSE	SW	YES	2008	ADIT
BULL CANYON 593A1	BWEBU0423	MONTROSE	SW	YES	2008	COMPLEX
CEMENT CREEK 104	FCEME0004	LA PLATA	SW	YES	2000	ADIT
COUGAR C14	BCOUG0122	SAN MIGUEL	SW	YES	2001	COMX
COUGAR C17	BCOUG0014	SAN MIGUEL	SW	CULV	2000	COMX
COUGAR C5	BCOUG0002	SAN MIGUEL	SW	YES	2000	COMX
COUGAR LC1	BCOUG0004	SAN MIGUEL	SW	YES	2000	COMX
DANS 1	BDANN0001	SAN MIGUEL	SW	YES	2000	COMX
DAVIS MESA 3A1	BDAVI0703	MONTROSE	SW	YES	2008	ADIT
DAVIS MESA 7A16	BDAVI0725	MONTROSE	SW	YES	2008	ADIT
DAVIS MESA 7A21	BDAVI0730	MONTROSE	SW		2008	ADIT
DAVIS MESA 7A23	BDAVI0732	MONTROSE	SW	YES	2008	ADIT

Site	ID Number	County	Region	Gate	Year	Type
DAVIS MESA 7A23	BDAVI0732	MONTROSE	SW		2008	ADIT
DAVIS MESA 7A28	BDAVI0737	MONTROSE	SW		2008	COMPLEX
DAVIS MESA 7A29	BDAVI0738	MONTROSE	SW	YES	2008	COMPLEX
DAVIS MESA 7A3	BDAVI0712	MONTROSE	SW	YES	2008	COMPLEX
DAVIS MESA 7A6	BDAVI0715	MONTROSE	SW	YES	2008	COMPLEX
DAVIS MESA 7A7	BDAVI0716	MONTROSE	SW	YES	2008	COMPLEX
DEADMAN CREEK MINE	PMINE0060	SAGUACHE	SW			MINE
DOLORES MINE	PMINE0017	MONTEZUMA	SW			MINE
DRG BURNWELL 1	DDUGO9103	LA PLATA	SW	YES	1991	ADIT
DRG OLD PEACOCK	DDUGO9106	LA PLATA	SW	WIN	1991	ADIT
EAST BULL CANYON	BEABU0437	MONTROSE	SW	YES	2004	ADIT
EASTERN STAR MINE	DCRES0210	SAGUACHE	SW			MINE
FULL MOON 677	BCOUG0137	SAN MIGUEL	SW	YES	2001	ADIT
FULL MOON 678	BCOUG0138	SAN MIGUEL	SW	YES	2001	ADIT
GYP SUM 450A1	BGYPS0204	MONTROSE	SW	YES	2002	COMX
GYP SUM 455A2	BGYPS0215	MONTROSE	SW	YES	2002	COMX
GYP SUM 461 A1	BMONT9606	MONTROSE	SW	YES	1996	STOP
GYP SUM 465A1	BMONT9602	MONTROSE	SW	YES	1996	DECL
GYP SUM 472A1	BGYPS0245	MONTROSE	SW	PEND	2002	ADIT
HENSON CREEK 19	DHENS9919	HINSDALE	SW	UNK	1999	ADIT
HENSON CREEK 30	BHENS9930	HINSDALE	SW	LADD	1999	ADIT
HENSON CREEK 40	BHENS9940	HINSDALE	SW	WIN	1999	ADIT
HIEROGLYPHIC 1540	BHIER0318	MONTROSE	SW	YES	2003	ADIT
HIEROGLYPHIC 1543A2	BHIER0322	MONTROSE	SW	YES	2003	ADIT/CO
HIEROGLYPHIC 1547	BHIER0332	MONTROSE	SW	YES	2003	ADIT
HIEROGLYPHIC 1553A1	BHIER0343	MONTROSE	SW	YES	2003	ADIT/CO
HIEROGLYPHIC 1555	BHIER0350	MONTROSE	SW	YES	2003	ADIT
HIEROGLYPHIC 519 A1	BHIER0309	MONTORSE	SW	YES	2003	ADIT/CO
HIEROGLYPHIC 521 A1	BHIER0314	MONTROSE	SW	YES	2003	ADIT
JOE DAVIS 513	BSPUD0186	SAN MIGUEL	SW	YES	2001	ADIT
JOE DAVIS 639 A1	BSPUD0108	SAN MIGUEL	SW	YES	2001	COMX
JOE DAVIS 639 A2	BSPUD0109	SAN MIGUEL	SW	YES	2001	COMX
LA PLATA 22	FLAPL0022	LA PLATA	SW	YES	2000	COMX
LA PLATA 33	DLAPL0033	LA PLATA	SW	YES	2000	ADIT
MONTROSE 449A2	BMONT9640	SAN MIGUEL	SW	YES		STOPE
NORTHERN LIGHTS 1	BCOUG0155	SAN MIGUEL	SW	YES	2001	ADIT
PARADOX 1292A1	BPARA0119	MONTROSE	SW	YES	2001	DECLINE
PARADOX 1293A1	BPARA0122	MONTROSE	SW	YES	2001	ADIT
PARADOX 278X	BPARA0138	MONTROSE	SW	YES	2001	ADIT
PICKET CORRAL 681	BPICK0301	MONTROSE	SW	YES	2003	ADIT
PINTO 445A1	BPINT0417	SAN MIGUEL	SW	YES	2004	ADIT
POWDERHORN 11	DPOWD0311	GUNNISON	SW	CULVLADD	2003	ADIT

Site	ID Number	County	Region	Gate	Year	Type
RAY MESA 1765A2	BRAME0608	MONTROSE	SW	YES	2008	COMPLEX
RAY MESA 1766A1	BRAME0620	MONTROSE	SW	YES	2008	DECLINE
ROC CREEK 1021A2	BROCC0810	MONTROSE	SW		2008	ADIT
ROC CREEK 1026A5	BROCC0828	MONTROSE	SW		2008	COMPLEX
ROC CREEK 776A1	BROCC0802	MONTROSE	SW		2008	ADIT
SIMON DRAW MINE	DDUGO9001	MONTEZUMA	SW	YES	1990	
SPUD PATCH 616A1	BMONT9609	SAN MIGUEL	SW	YES	1996	STOP
SPUD PATCH 620	BSPUD0148	SAN MIGUEL	SW	YES	2001	DECL
SPUD PATCH 621D1 (A1)	BSPUD0149	SAN MIGUEL	SW	YES	2001	COMX
SPUD PATCH 622A1	BMONT9615	SAN MIGUEL	SW	YES	1996	STOP
SPUD PATCH 622A3	BMONT9613	SAN MIGUEL	SW	YES	1996	STOP
SPUD PATCH 637A2	BSPUD0162	SAN MIGUEL	SW	YES	2001	COMX
TAILHOLT 431A2	BMONT9647	SAN MIGUEL	SW	YES	1996	COMX
TAILHOLT 431A3	BMONT9648	SAN MIGUEL	SW	YES	1996	COMX
TRAMP 504A1	BTRAM0208	MONTROSE	SW	YES	2002	COMX
TRAMP 524 (CONFIRM)	BTRAM0224	MONTROSE	SW	YES	2002	DECL
VULCAN 17	BVULC0417	GUNNISON	SW	UNK	2004	ADIT
VULCAN 24	XVULC0424	GUNNISON	SW	UNK	2004	ADIT
VULCAN 30	XVULC0430	GUNNISON	SW		2004	ADIT
VULCAN 31	XVULC0431	GUNNISON	SW		2004	ADIT
VULCAN 37	BVULC0437	HINSDALE	SW		2004	ADIT
VULCAN 40	XVULC0440	HINSDALE	SW		2004	ADIT
VULCAN 42	XVULC0442	HINSDALE	SW		2004	ADIT
WEDDING BELL 892A1	BWEDD0501	SAN MIGUEL	SW	YES	2005	ADIT
WEDDING BELL 892A3	BWEDD0503	SAN MIGUEL	SW	YES	2005	ADIT/CO
WEDDING BELL 895A1	BWEDD0524	SAN MIGUEL	SW	PEND	2005	ADIT
WEDDING BELL 904A2	BWEDD0564	MONTROSE	SW	PEND	2005	COMX
WEDDING BELL 907A5	BWEDD0580		SW		2005	COMX
WEDDING BELL 908A3	BWEDD0584		SW		2005	COMX
WEDDING BELL 910A1	BWEDD0591		SW		2005	COMX
WEST BULL CANYON	BWEBU0411	MONTROSE	SW		2004	ADIT/CO
WEST BULL CANYON	BWEBU0413	MONTROSE	SW		2004	ADIT/CO
WEST BULL CANYON	BWEBU0417	MONTROSE	SW		2004	ADIT/CO
WEST MONTROSE 24	BWMON9924	MONTROSE	SW	YES	1999	COMX
WEST MONTROSE 30	BWMON9930	MONTROSE	SW	YES	1999	COMX
WEST MONTROSE 32	BWMON9932	MONTROSE	SW	YES	1999	DECL
WEST MONTROSE 49	BWMON9949	MONTROSE	SW	YES	1999	COMX
WEST MONTROSE 55	BWMON9955	MONTROSE	SW		1999	COMX
WEST MONTROSE 62	BWMON9962	MONTROSE	SW	YES	1999	ADIT
WEST MONTROSE 73	BWMON9973	MONTROSE	SW	YES	1999	ADIT
YB55 HAPPY JIM	DYANK9355	SAN JUAN	SW	WIN	1993	ADIT

APPENDIX B

SOIL SAMPLING PROTOCOL

Prepared by: David Blehert

Date: 21 November, 2008

SUMMARY: Collect samples of particulate organic matter (e.g. soil, bat guano, small pieces of bat remains) from bat hibernation caves near areas in caves where bats are known to roost. The volume of sample collected should fill approximately half of the provided bag. Avoid collecting large sticks or leaves. Collect 5 samples per cave, and maintain samples on gel packs or in a refrigerator until shipping them overnight, on ice, to the Wildlife Health Section, 4330 West LaPorte, Fort Collins, CO 80521.

MATERIALS: 1) Vinyl exam gloves; 2) Wrapped, sterile tongue depressors; 3) Sterile, “whirl-pak” sampling bags; 4) Insulated shipping carton; 5) Freezer gel-packs, two per shipping carton; 6) Prepaid shipping label; 7) Sealable plastic bags to remove sampling wastes from caves.

PROCEDURE:

1. Select sampling locations. Choose locations near where the largest numbers of bats roost. Sample five locations per cave.
2. Label the outside of each “whirl-pak” sample-collection bag with the **date**, and **cave name**.
3. To avoid cross-contaminating the samples, wear vinyl gloves while collecting. Use a new pair of gloves to collect each sample. Avoid touching sampled material with fingers.
4. Unwrap a sterile tongue depressor, and use it to transfer a sample of organic matter from the cave floor, crevice, or other location into a labeled “whirl-pak” sample-collection bag.
5. Collect organic material to fill approximately half of the provided bag. Particulate sample material will be easiest to analyze. Avoid collecting large sticks or leaves.
6. To prevent cross-contamination of samples, use a new tongue depressor to collect each sample.
7. Seal “whirl-pak” sample-collection bag and immediately place it in an insulated cooler with a frozen gel-pack, but prevent samples from directly contacting the gel-packs. If it is not possible to bring a cooler into the collection site, maintain samples at cave temperatures until you exit the site. Upon exit, immediately transfer samples to a cooler with frozen gel-packs for transport to your vehicle. **DO NOT EXPOSE THE SAMPLES TO WARM OR FREEZING TEMPERATURES.**
8. Bag all wastes generated during sample collection (gloves, tongue depressors, wrappers) and remove from caves. Burn bagged waste or treat with bleach solution prior to disposal in trash.
9. Hold sealed sample bags in a refrigerator (**DO NOT FREEZE**) until ready to ship overnight to the CPW Wildlife Health Section using the provided prepaid FedEx shipping label. Ensure that gel-packs are frozen solid prior to sealing the package for shipment, and prevent samples from directly contacting gel-packs. Plan for samples to arrive at the Wildlife Health Section, 317 W. Prospect Rd, Fort Collins, CO 80526 within 7 days of collection. Ship samples early in the week to avoid weekend deliveries.

APPENDIX C
Bat White-nose Syndrome Survey Data Sheet

Mine/Cave Name:			
Date:	Time:	Owner:	
Personnel:			
Site Information			
Photo Taken of Entrance (y/n):	Entrance Aspect:	Entrance Elevation:	
Location Description:			
Zone:	UTMX:	UTMY:	UTM Datum:
Mine Gate (y/n):	Gate Door (y/n):	Key:	
Free Water (y/n):	Locations:		
Entrance Temperature:			
Other Temperatures:	Locations:		
Data Loggers Deployed (y/n):	Location:		
Soil Samples Collected (y/n):	Location:		
Acoustic Detector Deployed (y/n):	Location:		
Interior Photographs (y/n):	Location:		
Bat Information			
Bats Observed (y/n):	Location:		
Species Present:	Numbers:	Photographed (y/n):	
Bat Mortalities (y/n):	Location:		
Comments:			

APPENDIX D Decontamination Protocol

Bat White-Nose Syndrome Decontamination Protocol (v.3)

U.S. Fish and Wildlife Service – Draft 7.31.2010

The USFWS strongly recommends compliance with all cave closures, advisories, and regulations in all Federal, State, tribal, and private lands. By disregarding this recommendation, you could potentially promote the transmission of the fungus *Geomyces destructans* (*G.d.*), likely the causative agent for white-nose syndrome (WNS), which is responsible for significant bat mortality in eastern North America. Should you choose to disregard this recommendation, the following protocol outlines the best known procedures to help reduce the spread of the fungus. You should not handle bats. If you observe live or dead bats (5 or more individuals in a single location) that may exhibit signs of WNS, contact a wildlife professional in your state wildlife agency (<http://www.fws.gov/offices/statelinks.html>) or contact your nearest USFWS Ecological Services Field Office (<http://www.fws.gov/offices/>). Researchers, contact your state or federal agency for permitting requirements.

RECOMMENDED DECONTAMINATION PRODUCTS: The following chemical products were tested in a laboratory setting and were found to be particularly effective against killing the more resistant, spore-form of *G.d.*, as well as the hyphae.

1. **Lysol® IC Quaternary Disinfectant Cleaner** (0.3% quaternary ammonium compound minimum) - 1 part concentrate to 128 parts water or 1 ounce of concentrate per gallon of water;
2. **Lysol® All-purpose Professional Cleaner** (0.3% quaternary ammonium compound minimum);
3. **Formula 409® Antibacterial All-Purpose Cleaner** (0.3% quaternary ammonium compound minimum);
4. **A 10% solution of household bleach** - 1 part bleach to 9 parts water (an estimate of 1:9 is insufficient);
5. **Lysol® Disinfecting Wipes**; or
6. **Boil submersible gear in water for 15 minutes**

BEFORE CAVING: In order to effectively reduce the risk of human transfer of *G.d.*, it is imperative that you follow these decontamination procedures any time you plan cave visits, and **under no circumstances should clothing, footwear or gear that was used in a WNS-affected state or region be used in a non-affected state.** If gear cannot be thoroughly decontaminated or disposed of, we advise that you not enter caves or parts of caves requiring use of this gear. If gear can be thoroughly decontaminated and you must enter a cave, isolate and decontaminate these items after last exiting a cave. Gear should not be used in multiple caves in the same day unless the decontamination procedures below can be performed **between each cave visit.**

AFTER EACH CAVE VISIT: Thoroughly scrape or brush off any dirt and mud from clothing, boots, and gear and then place them in a sealed plastic bag or plastic container with lid to be cleaned and disinfected off site. Outer clothing should be removed prior to entering a vehicle after/between a site visit. A clean change of clothing is recommended. To decontaminate clothing, footwear and gear, please follow the procedures listed below.

For Submersible Gear (i.e. clothing and equipment that can be submerged without damage):

Wash all clothing and any appropriate equipment in washing machine or by hand using conventional detergents. Use cold, warm, or hot water. Woolite® fabric wash has been found to be highly effective for this procedure. Rinse thoroughly, and then follow by soaking for a minimum of 10 minutes in one of the decontaminating products above, then rinse and air dry. As an alternative to chemical products, boiling submersible gear at a fast boil for 15 minutes is also recommended, followed by air drying.

For Non-submersible Gear (i.e. equipment that will be damaged by submersion):

Clean thoroughly with soap and water, and then decontaminate by applying one of the recommended products above to the outside surface for a minimum of 10 minutes, then rinse and air dry.

For Footwear:

Where possible, rubber (wellington-type) caving boots (which withstand harsh decontaminating products and are easily cleaned) are recommended. Boots need to be fully scrubbed and rinsed to remove all soil and organic material. Decontaminate rubber and leather boots, (including soles and leather uppers) with a product listed above for a minimum of 10 minutes, then rinse and air dry.

For Ropes and Harnesses:

To date, only Sterling rope and webbing have proved to sustain no damage when using products above. Wash rope/webbing in a front loading washing machine on the gentle cycle using Woolite® Extra Delicates detergent. Immerse in a dilution of Lysol IC Quaternary Disinfectant Cleaner for 15 minutes. Rinse twice in clean water and air dry. Brands of rope/webbing other than Sterling have not yet been tested for integrity after decontamination. Brands not tested should be dedicated to a single cave or not used at all.

For Cameras and Electronic Equipment:

If possible, do not bring electronic equipment into a cave. If practical, cameras and other similar equipment that must be brought to a cave may be placed in plastic casing (i.e. underwater camera housing) or wrapped in plastic wrap where only the lens is left unwrapped to allow for photos to be taken. The plastic wrap can then be decontaminated by using Lysol® Disinfecting Wipes and discarded after use or wipes can be applied directly on camera surfaces or plastic casing.

For Vehicles:

In addition to gear, vehicles used to transport equipment can also harbor spores. Keep vehicles as clean as possible by storing gear in clean containers, and decontaminate those containers with your other equipment using the decontamination products above.

Note: Protocol updated as of 7-31-2010. Please visit <http://www.fws.gov/WhiteNoseSyndrome/> for updated materials and for **comprehensive supplemental documents that detail decontamination procedures for 1. cavers, and 2. researchers.**

APPENDIX E

White-nose Syndrome Survey Equipment and Supplies

General

- Standard field/hiking gear
- GPS unit
- Datasheet
- Spot Locator
-

Internal Survey

- Decontaminated coveralls or tyvek suit
- Decontaminated boots
- Hard hat
- Headlamp
- Flash light
- IR Thermometer (Extech 42510A)
- Gas Meter (Altair 4x Gas Detector)
- Relative Humidity Detector (Kestrel 3000)
-

Acoustic Monitoring

- Wildlife Acoustics SM2BAT 192kHzx2
- SD Cards
- Ultrasonic microphone (SMX-US)
- Battery source (SM2 Power Adapter, Solar panels, battery, etc.)
-

Decontamination

- **RECOMMENDED DECONTAMINATION PRODUCTS:** The following chemical products were tested in a laboratory setting and were found to be particularly effective against killing the more resistant, spore-form of G.d., as well as the hyphae.
 - **Lysol® IC Quaternary Disinfectant Cleaner** (0.3% quaternary ammonium compound minimum) - 1 part concentrate to 128 parts water or 1 ounce of concentrate per gallon of water;
 - **Lysol® All-purpose Professional Cleaner** (0.3% quaternary ammonium compound minimum);
 - **Formula 409® Antibacterial All-Purpose Cleaner** (0.3% quaternary ammonium compound minimum);
 - **A 10% solution of household bleach** - 1 part bleach to 9 parts water (an estimate of 1:9 is insufficient);
 - **Lysol® Disinfecting Wipes**; or
 - **Boil submersible gear in water for 15 minutes**
-

Video Recording

- Sony HDR-CX560V
- IR Light Kit (Bat Conservation and Management, Inc.)
-

Microclimate Recording

- iButton (DS1923-F5#, Maxim Integrated Products)
- Mounting Fob (DS9093AY+, Maxim Integrated Products)
-

Soil Sampling (All items are available from Fisher Scientific – www.fishersci.com/. Indicated prices are catalogue list price – discounts usually apply.)

- Fisherbrand Powdered Vinyl Exam Gloves, size Extra-Large, Catalogue #19-041-189E; \$71.29 for 10 boxes of 100
- Sterile, individually-wrapped, Puritan tongue depressors (6" X 11/16"), Catalogue # 01-347; \$78.35 per case of 1000. Or
- Fisherbrand Sterile Sampling Bags (4 oz, 3" X 7"), Catalogue #01-815-21; \$132.17 for 2 packs of 500
- Thermosafe Multipurpose Insulated Shippers (8"L X 5.88"W X 4"D – inside dimensions), Catalogue #11-676-14 (SCA Thermosafe #318); \$131.01 for 12
- Thermosafe Refrigerant Packs (-23°C, 8 oz, 6"L X 4"W X 3/4"D), Catalogue #03-530-47 (SCA Thermosafe #432); \$38.27 for 36
-

APPENDIX F
Care and Handling of Dead/Moribund Bats

1. **Dead Bats:** Bat mortalities are to be placed in individual Ziploc bags and shipped on ice to the Wildlife Health Section, 4330 West La Porte Avenue, Fort Collins, CO 80521. If more than 5 bats are found dead, a sample of 5 bats will be collected and an estimate of the total number found recorded. Select the freshest bats for submission. Details of the mortalities must be documented on the WNS Survey Data Sheet. Live bats are not to be handled or disturbed for the collection of these data.

2. **Moribund Bats:** Any moribund bats are to be placed in individual small cloth bags and relayed in a cooler to the Wildlife Health Section, 4330 West La Porte Avenue, Fort Collins, CO 80521, as quickly as possible. Any dead bats should be transported as in #1 above in a separate container.

**PROTOCOLS
SM2 BAT DETECTOR SETTINGS
2011 WNS ACOUSTIC MONITORING
COLORADO PARKS & WILDLIFE
Revised fall 2011**

Use these settings for your SM2 for WNS *Winter* Monitoring sites:

On each detector, set up as follows:

JUMPERS:

This sets the gain on your detector to 48dB, for both microphones:
Move your jumper caps to cover the 2 pegs as follows:

- 1st row = 3&4 and 7&8
- 2nd row = 3&4 and 7&8
- 3rd row = 2&3 and 6&7
- 4th row = 3&4 and 7&8

(There are 5 rows of jumpers, on the left side of the panel. The first, or top row, doesn't have any options, so skip that row, and consider the remaining 4 rows of jumpers. As there are 8 pegs available in each row, number them from left to right, 1- 8.)

Photos by C. Lausen



POWER SOURCE:

Set the jumpers to External power.

PANEL SETTINGS: (Note: These can also be set in the Song Meter Configuration Utility. **USE THE FOLLOWING IF PROGRAMING FROM THE DETECTOR.** Skip to page 3 if using the Song Meter software for settings.)



Wake up the unit and push "Select" to get to the main menu: Go to "Settings"

TIME & DATE:

Adjust time & date if necessary. May have to adjust for daylight savings.
"Sunrise/sunset" is OK.



LOCATION:

Here is a website that covers info that is helpful for these settings - [Complete Sun and Moon Data for One Day: U.S. Cities and Towns — Naval Oceanography Portal](#) . Add your "location" coordinates: Lat/Long, from your site or general area of deployment. You can use this website to get lat-long for an area close to your work areas, using the sun and moon data search. Your lat-long info is used to tell the SM2 when sunrise and sunset will occur, to run the programs you plan for it. Make sure you have the right time

zone from UTC, which is -7 in your settings for Mountain Standard Time. You will need this if you are going to "sleep" your unit until a later start date.

AUDIO Settings:

Use the following for your unit:

Sample Rate = 192,000

Channels: When using 1 microphone, which is the recommended standard set up, use the "Mono-L" option. However, if you are part of the experimental effort to record at both the portal and external, use "stereo" option. The stereo option will use up much more power (~25%), so it will require a solar recharge set up, and a second microphone.

COMPRESSION: WAC-0

GAIN: 0.0 left, 0.0 right

ADVANCE SETTINGS: (Select)

Dig HPF Left – FS/8 – (provides a low frequency cut-off of 24 kHz)

Dig HPF right – FS/8

Dig LPF Left – Off

Dig LPF right – Off

Trg Lvl Left – 16 SNR

Trg Lvl right – 16 SNR

Trg Win left – 1.0s

Trg Lvl right – 1.0s

Div ratio - 16

Sensor Settings:

Leave at defaults. (This is for the temperature sensors, which are not being used)

0: (linear)

1: (Linear)

****Re-format your new SD cards prior to use. ****

Scheduling your SM2 Using the Song Meter Configuration Utility:

A SET file is provided for you to set the schedule the SM2 will run on. Our goal for monitoring WNS continues to be collecting baseline activity levels across a 24/7 period from the months of January through April. Recording will start January 1st and continue until manually interrupted for battery or data card swaps. This schedule will allow the unit to record until the battery is dead, or the cards are full. Breaking recording sessions into roughly 1 hour segments will limit the loss of data should the power fail to only that hour interrupted by the power outage. While more WAC files are generated using this type of schedule less data is at risk of being lost as the SM2 only saves data collected when a "PAUSE" or "UNTIL" command are used.

To adjust the SET file for a specific site:

1. Open Song Meter Configuration Utility 2.2.6 and use the File menu to Load the WNS.SET file provided. Updated versions can be downloaded at the following link:
(<http://www.wildlifeacoustics.com/wa-php/downloads.php>)

2. Under the "General" tab insure that the settings are as follows:

- Model = SMBAT
- Schedule = Advanced
- Schedule Start Date and Time = 10/20/11 and 00:00:00 * (This field automatically defaults to the present date and time when the SET file is opened in Song Meter and only affects how the calendar below appears)
- Recording Commands (Each command starts on a new line – see red arrow in figure below)

❖ *Solar setups where a delayed start will be utilized before recording:*

01 PAUSE 12:00:00

02 GOTO LINE 01 1X (Change 1X to adjust the # of days to delay start of recording, e.g. 5X = 3 days because the first PAUSE line delayed 12 hours and 5*12 = 60 more hours of delay)

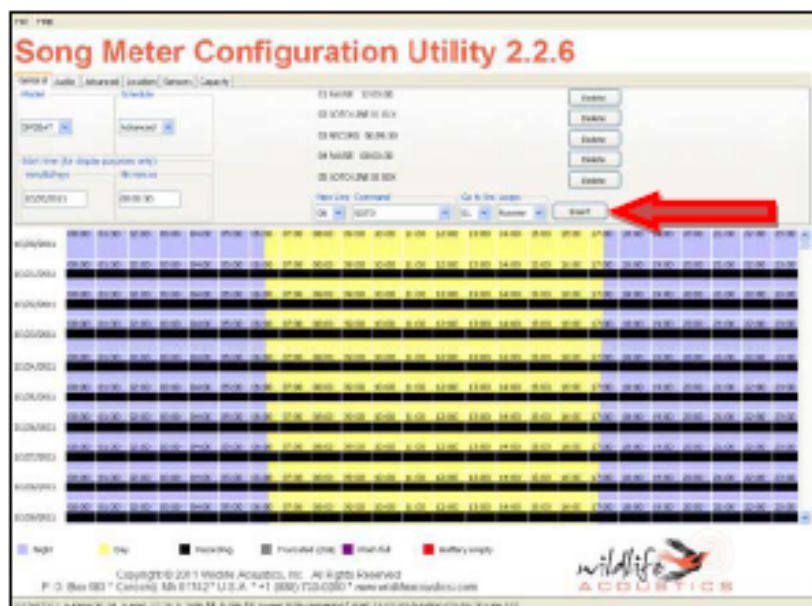
03 RECORD 00:59:30

04 PAUSE 00:00:30

05 GOTO LINE 03 00X

(00X is inserted when 'forever' is selected for Loops)

Note: To insure recording starts by Jan 1, 2012, set the delay to initiate recording on Dec 31, 2011. Count the number of days to Dec 31st from the planned deployment date (day the detector is powered and SET file uploaded). For example, a detector deployed on Dec 1st at 1 PM should be delayed '59X' to insure recording starts on the 31st at 1 PM. This deployment method will allow flexibility in that regardless of the time the SET file is uploaded the recording will start a day early.



- ❖ *Manually initiated recording:*
 - 01 RECORD 00:59:30
 - 02 PAUSE 00:00:30
 - 03 OTO LINE 03 00X (*00X is inserted when 'forever' is selected for Loops*)

3. "Audio" tab:

- 01 Sample Rate = 192000
- 02 Channels = Mono-L (*some test sites will utilize both channels*)
- 03 Compression = WACO
- 04 Microphone Gain = Leave this setting unchecked

4. "Advanced" tab:

- HPF Left – FS/8
- LPF Left – Off
- HPF Right – FS/8
- LPF Right – Off
- Div Ratio - 16
- Trg Left – 16 SNR
- Trg Win Left – 1.0s
- Trg dB Right – 16 SNR
- Trg Win Right – 1.0s

5. "Location" tab:

- Prefix = Enter the name of the site being monitored here. This name will be appended to all WAC files generated using this SET file so it is recommended to save a distinct SET file for each site. Use a name that is short but makes sense to others who may look at the data at a later time.
- Solar Mode = Sunrise/set
- Timezone = - 07:00
- Latitude = [Complete Sun and Moon Data for One Day: U.S. Cities and Towns — Naval Oceanography Portal](#)
- Longitude = Use link above

6. "Sensors" tab: Do not override any sensors at this time.

7. "Capacity" tab:

- Note: *These settings do not program into the detector; they are only used to display the duration of recordings based on the program & power source you are developing with the software. You will still need to place your jumper on the desired power source!
- Flash Card Capacities = set appropriate card sizes placed in detector
- Power Consumption
 - Power Source = External
 - Battery Type = Grayed out
 - mAh capacity = 80000 (80 Ah battery)
 - %/mo discharge = 0 (This field needs to be reset each time the file is opened)

Note: The calendar at the bottom half of the screen will indicate when the given battery is predicted to fail. If a solar setup is being used ignore this timeline.

To upload a programmed SET file onto the SM2 detector:

1. Copy the SET file you saved after assigning it site specific values to a flash card that will be placed into Slot A of the detector. Note: All flash cards should be formatted before you save a SET file to them. Cards can be formatted in Windows Explorer by right clicking the drive and selecting "Format" from the options.
2. Turn on the detector and under the Main Menu select the Utilities submenu.
3. Arrow down to the "Load config from A:" option and select.
4. The site specific SET file should appear, select this file. After the SET file is loaded the detector will read "CONFIGURATION LOADED".



Photo by C. Lausen

5. At this point select the "Back" button to return to the Main Menu.
6. Finally, hit the Wake/Exit button to put the detector into sleep mode until the date of start up. As the detector shuts down the display screen will indicate the scheduled start up date for recording.



Photos by C. Lausen

Checking the Detector:

1. Detectors will need to be checked periodically to insure that power is still being supplied and that memory space is adequate. Amount of disk space used can be determined by looking on the display screen when check the unit.
2. Use the "Back" button to stop the recording and save the data before you switch out batteries/power supply or change memory cards.
3. Re-start the program by pushing the "Wake/Exit" button. **DO NOT push the reset button!!!**

****Re-format your new SD cards prior to use. ****

SM2 DEPLOYMENT GUIDELINES (Revised fall 2011):

Use these guidelines for selecting the location for your SM2 for WNS Winter Monitoring sites:

Choose between an internal or external microphone set up based on security issues, portal size, distance of gate to portal entrance, and internal conditions of the mine or cave. An external set up is the preferred method, but may not be possible under some conditions.

AVOID:

- Selecting a monitoring site that has standing or running water present – this will lead to noise dominating the recordings. External set-ups should also avoid nearby water.
- Attaching your microphone to the gate, if at all possible. This may be contributing to issues with excessive echo / noise.
- Cables, containers, etc., blocking the bat access of the gate.

Use External Deployment IF:

- Security not an issue
- Mine / cave opening is small
- Gate is at or near the entrance
- Culvert gate designs
- Pooled water inside mine

Use Internal Deployment IF:

- Security an issue
- Timbers or suitable rock surface for microphone attachment other than gate
- Recessed gate, or no gate present

TIPS & SUGGESTIONS:

- Try to set your microphone 10 – 30 ft away from the portal/entrance to be monitored.
- Avoid, if possible, setting microphones too close to large, reflective objects like rock outcrops, structures, and the ground.
- Point microphone towards the portal/entrance.
- Try to place the microphone higher off the ground by using a pole for attachment, use an extension cable if necessary to place the microphone in a more ideal location setting than the SM2 and battery storage container would provide (i.e. visual security issues).
- Use plastic tubing to protect cables from packrats and other animals, if necessary. Use flexible tubing, and a plumbers tape to help feed the cables through the tubing.
- Re-format each new SD card prior to use in winter acoustic monitoring.
- Even if you will be checking & switching out SD cards on a regular basis, use multiple cards in your unit. This will ensure that recordings will continue even if you have a card error.

DEPLOYMENT FIGURES

Avoid internal set ups at culvert gates, & attachment of the microphone to the gate.



Avoid pooled or flowing water inside / outside feature.



If packrats are a concern, use tubing to protect your cables & connections. Suspend microphone from ceiling, if possible



Shoot for 10 – 30 ft from entrance and other large, reflective features.



Sample of a non-solar external set-up. Use metal posts or PVC tubing over a T post.





Ideas for external microphone set ups:



2" PVC pipe (schedule 40) and fittings will fit over a standard T-post, and can be used to deploy microphones at higher levels above the ground, either attached to the SM2/battery container, or off-set using longer cables. Connecting tubing should be at least $\frac{3}{4}$ - 1" ID for your SM2 cables to fit inside. Larger diameter tubing will make it much easier for you to work the cables through the tube, and will be needed if you have to run more than 1 cable in the tubing (i.e. stereo microphones, microphone + solar battery cords, etc.). The more flexible the tubing (like pool tubing), the easier it will be to run your cables, especially with longer lengths of tubing. Hint: Use plumbers fishing tape to pull your cables through the tubing.

Electrical junction boxes and solid electrical 90 curves can be used to help attach your microphones to the substrate or wood frames, when deploying an internal set up.