



United States Department of the Interior



FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

March 1, 2012

Mr. Clyde N. Thompson
Forest Supervisor
Monongahela National Forest
200 Sycamore Street
Elkins, West Virginia 26241

Re: Biological Assessment and Addendum for the Upper Greenbrier North Project located on the Greenbrier Ranger District of the Monongahela National Forest, Pocahontas County, West Virginia

Dear Mr. Thompson:

This letter is in response to your August 17, 2011, Biological Assessment (BA) and Addendum for a site-specific review of the Upper Greenbrier North (UGN) Project located on the Greenbrier Ranger District of the Monongahela National Forest (MNF) in Pocahontas County, West Virginia. As part of the UGN Project, the MNF proposed to conduct a variety of forest management actions within an 86,500-acre (35,005.31-hectare [ha]) area in Pocahontas County, West Virginia. The following comments are provided pursuant to the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

The MNF made a range of determinations including “no effect”, “may affect, not likely to adversely affect”, and “may affect, likely to adversely affect” listed species pertaining to the UGN Project proposed actions. The U.S. Fish and Wildlife Service (Service) will address species determinations individually. In your letter, the MNF requested the Service’s concurrence on determinations of “no effect” for the Cheat Mountain salamander (*Phethodon nettingi*), and shale barren rock cress (*Arabis serotina*), and determinations of “may affect, not likely to adversely affect” for the Virginia big-eared bat (*Corynorhinus townsendii virginianus*), running buffalo clover (*Trifolium stoloniferum*), Virginia spiraea (*Spiraea virginiana*), West Virginia northern flying squirrel (WVNFS) (*Glaucomys sabrinus fuscus*), and small whorled pogonia (*Isotria medeoloides*). In addition, the MNF requested initiation of formal consultation with a “may affect, not likely to adversely affect” determination on the Indiana bat (*Myotis sodalis*) under the Tier II process described in the Programmatic Biological Opinion (BO) for the MNF Forest Plan (Service 2006).

The Service has reviewed the BA and Addendum, and has had additional project-specific discussions with your staff. As a result of this review, and as described in more detail in Enclosure 1 below, we developed recommendations to minimize adverse impacts to the WVNFS. We submitted a draft of this document to the MNF on February 14, 2012, for review. The MNF subsequently responded on February 14, 2012, confirming the MNF will incorporate and implement the recommendations into the UGN Project.

Enclosure 1 evaluates all potential impacts from the MNF's proposed UGN actions on the WVNFS and specifically addresses the sanctions proposed to occur within WVNFS habitat. On February 14, 2012, we concurred that four of the five MNF determinations pertaining to non-commercial spruce restoration, non-commercial timber stand improvement, road and trail decommissioning, and aquatic passage and riparian restoration activities "may affect", but are "not likely to adversely affect" the WVNFS. However, additional analysis was needed on the potential impacts to WVNFS from the proposed removal of overstory trees and commercial spruce restoration in WVNFS habitat. Therefore, we did not initially concur on the removal of overstory trees and commercial spruce restoration in WVNFS habitat. In subsequent discussions with your staff, the MNF agreed to drop this proposed commercial spruce restoration activity from the proposed UGN Project. Because the proposed commercial spruce restoration activities have been omitted, the Service now concurs with the MNF "may affect, not likely to adversely affect" determination based on these revisions.

We have finalized the tier II BO (Enclosure 2) after considering comments from the MNF on our February 14, 2012, draft of this document, including clarification of timber harvest acreages, written commitments from the MNF to implement our recommendations into the UGN project, and a request from the MNF to finalize the BO. In our final tier II BO, we provide an incidental take statement for the Indiana bat and we concur with the MNF determinations of "may affect", but are "not likely to adversely affect" running buffalo clover, Virginia Spiraea, small whorled pogonia, and Virginia big-eared bat, pertaining to the proposed UGN Project actions. If any modifications are made to the proposed UGN Project, or if additional information on listed and proposed species becomes available, these determinations may be reconsidered.

The Service appreciates the opportunity to work with the MNF in fulfilling our mutual responsibilities under the Endangered Species Act. If you have any questions regarding this letter, please contact Ms. Barbara Douglas of my staff at (304) 636-6586, Ext. 19, or at the letterhead address.

Sincerely,


For Deborah Carter
Field Supervisor

Enclosures (2)

cc:

Project File

Reader File

MNF Greenbrier District – J. Tribble

MNF SO – D. Arling

WVDNR – C. Stihler

FOB - J. Rodd

ES:WVFO:BDouglas:skd:2/29/2012

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Enclosure 1
**Review of the Upper Greenbrier North Biological Assessment Addendum for the
West Virginia Northern Flying Squirrel**

The Biological Assessment for the Upper Greenbrier North (UGN) Project was originally developed during the interim period of time when the WVNFS was not on the list of Federally-endangered species. As a result, potential effects to the WVNFS were not covered in the BA. When the WVNFS was relisted, the MNF prepared an Addendum to the BA that evaluated effects to this species.

As described on pages 8-11 and Appendix B of the August 2011 Addendum to the BA, suitable WVNFS habitat within the action area was mapped using the best available information, including previously conducted habitat modeling and mapping efforts, interpretation of aerial photography, and extensive field reviews. MNF staff also reviewed results of 20 years of WVNFS survey efforts conducted within the action area, as detailed in Appendix A. Suitable WVNFS habitat was identified as areas with greater than 10 percent of spruce conifer overstory, with buffers of 262 feet (79.86 meters) around each identified area. Thus, the map of suitable WVNFS habitat includes areas of predominately hardwood forest that are adjacent to areas with predominately or mixed coniferous spruce overstory. This is consistent with available research about habitat use by the WVNFS (Ford *et al.* 2007, Menzel *et al.* 2006, Ford *et al.* 2004). A map showing areas identified as suitable WVNFS habitat was provided in May 2011, and was updated in September 2011. The resulting habitat maps include all areas where WVNFS have been captured. These maps identified approximately 32,000 acres (12,949.94 ha) of suitable WVNFS habitat within the approximately 86,500-acre (35,005.31 ha) action area. The Service agrees that the resulting map provides the best available delineation of where the WVNFS is likely to be present within the action area, and could potentially be affected by any proposed activities.

As part of the UGN Project, the MNF proposed to conduct all of these activities occurring either inside or outside suitable WVNFS habitat on the MNF. These include oak ecosystem restoration, prescribed fire, aquatic passage and riparian restoration, timber production and hardwood stand regeneration through commercial timber harvest, non-commercial timber stand improvement, non-commercial spruce restoration, commercial spruce restoration, even-aged management for spruce-hardwood regeneration, road work related to timber harvest, road maintenance, road and trail decommissioning, and recreational site improvements,. Work will be conducted over a ten year period.

The MNF proposed to conduct several activities outside suitable WVNFS habitat. No oak ecosystem restoration, prescribed fire, timber production and hardwood stand regeneration through commercial timber harvest, maintenance or road work related to timber harvest, or recreational site improvements are proposed to occur within suitable WVNFS habitat. The MNF proposes to conduct 2,050 acres (829.61 ha) of non-commercial spruce restoration, 549 acres (222.17 ha) of non-commercial timber stand improvement, and 646 acres (261.43 ha) of commercial spruce restoration in areas that are not suitable for the WVNFS. Because these

activities will occur in areas that are not likely to be occupied or used by the WVNFS, we agree that these proposed activities will not affect the WVNFS. Therefore, these proposed actions will receive no further consideration in this document.

The MNF had originally proposed to conduct even-aged management for spruce-hardwood regeneration and spruce release through commercial thinning of red pine plantations in suitable WVNFS habitat. However, due to concerns about potential adverse impacts to the WVNFS, these activities have been dropped from the proposed action. The justification for this decision is fully described in the August 2011 Addendum to the BA (pages 7-8). The Service agrees that additional research is needed in order to determine how these activities may affect the WVNFS and its habitat, and supports the MNF's decision to not conduct these activities in suitable WVNFS habitat.

Of the remaining activities, the following are proposed to occur within suitable WVNFS habitat: 2,704 acres (1,094.27 ha) of non-commercial spruce restoration, 1,390 acres (562.51 ha) of noncommercial timber stand improvement, 302 acres (122.22 ha) of overstory tree removal and commercial spruce restoration, 68.8 miles (110.72 kilometers [km]) of road and trail decommissioning, and aquatic passage and riparian restoration at 39 sites. The effects of these activities are discussed in more detail below. The total amount of each proposed activity and acres of suitable WVNFS habitat potentially affected are provided in Figure 1 of the BA.

The MNF's Forest Plan describes conditions under which activities may be conducted within suitable WVNFS habitat, including if research has documented the activity will improve or maintain WVNFS habitat, or if a project-level assessment concludes that the activity is not likely to adversely affect the WVNFS. The Forest Plan was also designed, in consultation with the Service, to allow and encourage the MNF to actively engage in management to restore and enhance high elevation red spruce-hardwood ecosystems. The development of activities in WVNFS habitat that are geared towards the restoration and enhancement of the spruce-hardwood ecosystem is consistent with the intentions of the Forest Plan, and the MNF and Service's mutual goals, and is supported by working groups such as the Central Appalachian Spruce Restoration Initiative (CASRI). As described in the BA Addendum, all of the activities proposed to be conducted within suitable WVNFS habitat are designed to restore or enhance the red spruce-hardwood ecosystem on which the WVNFS and other species depend. Activities have been designed that increase the structural diversity of vegetation, increase the amount of spruce in the overstory, enhance both aquatic and terrestrial habitat connectivity, and improve the quality of aquatic systems.

In order to ensure that the activities proposed to be conducted within WVNFS habitat would either benefit or not adversely affect the WVNFS and are based on the best available science, the Service requested that the BA Addendum for the WVNFS be peer reviewed. Peer reviewers included experts on the biology of the WVNFS, foresters who have conducted research on red spruce ecosystem dynamics, and experts on the restoration and management of the high elevation red spruce/hardwood ecosystem. All the peer reviewers responded that the proposed activities were generally designed consistent with available research and should have a long-term beneficial effect on the WVNFS and its habitat. Long-term benefits that were identified include creating forests with composition and stand structures more closely associated with WVNFS,

and expanding and connecting stands of suitable WVNFS habitat. However, some reviewers commented that the potential exists for localized short-term impacts to individual squirrels while some treatments were being implemented, and recommended that additional details, analysis, or precautions be developed. We have, therefore, conducted a more detailed review of each type of action proposed to occur within suitable WVNFS habitat and provided separate determinations and recommendations for each one.

Non-commercial Spruce Restoration

The MNF proposed to conduct non-commercial spruce restoration on 2,704 acres (1,094.27 ha) of suitable WVNFS habitat. Within this acreage, the MNF would select and girdle eight to ten trees per acre in order to create snags and openings within the canopy of up to 0.1 acre (0.04 ha) in size, which would mimic natural disturbance patterns. The MNF would also selectively remove midstory vegetation, especially striped maple and diseased beech brush, either through direct application of herbicide to target vegetation or through mechanical felling. No trees greater than 6 inches (15 centimeter [cm]) diameter breast height (DBH) or with a visible cavity would be removed. WVNFS typically do not use trees smaller than this for denning or nesting (Menzel 2003, Menzel *et al.* 2004). The MNF would treat no more than 30 percent of the total acreage proposed for these activities and would select areas for treatment based on the presence of scattered patches of suppressed red spruce in the understory. These activities are designed to release existing red spruce seedlings and saplings in the under and midstory and eventually increase the red spruce overstory component.

Research suggests that this approach to opening the understory should be beneficial to the WVNFS. Rentch *et al.* (2007) states that herbicide injection into hardwood trees to release understory spruce can potentially double spruce growth rates and that releasing understory red spruce by creating small canopy gaps could be an effective way to restore the red spruce component by emulating the natural disturbance regime. Natural canopy gaps in spruce forest types in the southern Appalachians are typically created by the loss of individual trees (Rentch *et al.* 2007) and the selective girdling and removal of individual hardwood trees as proposed by this approach would likely have a similar, beneficial effect to red spruce.

Because the proposed activity would not involve the removal of any trees larger than 6 inches (15 cm) DBH or with a visible cavity, no WVNFS den or nest trees would be affected and no WVNFS would be displaced by the proposed action. WVNFS habitat usage appears to be positively correlated with the presence of an increased number of spruce, a mature forest with differentiated tree heights, and increased number of snags (Smith 2007, Ford *et al.* 2007). The immediate creation of snags coupled with the increase of spruce and structural diversity of the forest, while still maintaining the existing overstory composition of stands, could potentially result in an increase of WVNFS usage within treatment areas, and would indicate that WVNFS feeding, breeding, and sheltering would not be impaired. Herbicide use would be targeted directly on vegetation to be removed and the proposed application rates of Glyphosate and Imazapyr are below levels that would indicate risks to mammals (SERA 2011a, SERA 2011b). The MNF has determined that these proposed non-commercial spruce restoration actions “may affect”, but are “not likely to adversely affect”, the WVNFS. The Service concurs with the MNF determination, and we conclude these proposed activities may beneficially affect the WVNFS.

Non-commercial Timber Stand Improvement

The MNF proposes to conduct non-commercial timber stand improvement on 1,390 acres (562.51 ha) within suitable WVNFS habitat. Activities would be similar to those described for non-commercial spruce restoration except that these treatments would occur in young stands that are typically less than 30 years old and no more than 45 years old. This activity is designed to release desirable crop trees or mast producing trees in treatment areas. Tree seedlings may also be planted to increase mast-producing trees or conifer components in mixed stands. Effects to WVNFS would also be similar to those described for non-commercial spruce restoration except that WVNFS would be less likely to be nesting or sheltering in these areas because of the limited number of large, mature trees present in these younger stands. Therefore, there is very little potential that a WVNFS would be disturbed as a result of this activity. There is also a reduced potential for immediate beneficial effects when compared to the effects of noncommercial spruce restoration, because of the time that it will take to develop large, mature, overstory trees and a fully diversified stand structure. Benefits associated with an increase in the spruce component in the area and increased structural diversity will still occur over the long-term. One peer reviewer did note that increasing mast-producing species and planting oaks in suitable WVNFS habitat could benefit the southern flying squirrel (*Glaucomys volans volans*), a species that is known to compete for nest sites with the WVNFS. While the BA did not specify which areas would be planted with oaks or conifers, portions of the UGN planning documents state that red spruce will be treated as a crop tree when present, and that red spruce would be planted in suitable WVNFS. The MNF has clarified that no oaks would be planted within suitable WVNFS habitat, therefore this potential concern has been addressed. The MNF has determined that these proposed non-commercial timber stand improvement actions “may affect”, but are “not likely to adversely affect”. We conclude these activities may beneficially affect the WVNFS. The Service concurs with the MNF determination.

Removal of Overstory Trees

A number of proposed actions involve the removal of overstory trees within suitable WVNFS habitat. As conservation measures for these activities, the MNF proposed to retain all hardwood trees over 6 inches (15 cm) DBH with a visible cavity and all conifers greater than 10 inches (25 cm) DBH. These types of trees are most likely to be used by nesting or denning WVNFS. If avoidance of these trees is not possible, trees meeting these criteria will be cut between September 15 and March 31 when immobile young are not likely to be present. While implementation of these measures will significantly reduce the potential for direct take, and may be sufficient to ensure that the potential adverse effects are discountable for small-scale projects that employ a limited removal of large trees, the Service is concerned that these measures may not be sufficient to avoid potential impacts to WVNFS when applied on a large-scale project such as is currently proposed for the UGN to minimize. In addition, the successful implementation of these measures will require that the MNF retains sufficient staff with the experience and time to evaluate all potential large trees to be cut, and assumes that a high percentage of cavities and nests will be easily visible. The default of allowing trees to be cut only during time periods when immobile young are not present may allow for direct take to be avoided, but does not ensure that the cumulative scale of large tree removal within suitable WVNFS habitat will be minimal and discountable over time.

The MNF proposed to use these same measures to minimize impacts during commercial spruce restoration, road and trail decommissioning, and aquatic passage and riparian restoration. We provide the following analysis which further quantifies potential impacts and recommends additional conservation measures to address these activities.

Commercial Spruce Restoration

The MNF proposed to conduct commercial spruce restoration on 302 acres (122.22 ha) within suitable WVNFS habitat. Within this area, the MNF would selectively remove up to 1/3 of the hardwood overstory as well as conduct non-commercial activities similar to those described above. Within areas mapped as suitable WVNFS habitat, this activity is only proposed to be conducted in the established hardwood-dominated buffer zones that are adjacent to stands with significant red spruce. The MNF estimated that somewhere between 30 and 50 acres (12.14 and 20.23 ha) of WVNFS habitat could be affected by this activity during a given field season. This activity is designed to release existing red spruce saplings and seedlings in order to increase the red spruce overstory component and to create age diversity in predominately even-aged hardwood stands.

This activity has been designed consistent with some of the measures recommended in the spruce restoration approach developed by CASRI (2011) and some available research suggests that the approach would have long-term beneficial effects by enhancing habitat for the WVNFS (Rentch *et al.* 2007). Long-term beneficial effects to the WVNFS could include increasing coarse woody debris and structural diversity, as well as diversifying size and age structure of even-aged stands.

However, some peer reviewers noted that there was also the potential for short-term adverse impacts in localized treatment areas that could result in stands becoming unavailable or less suitable to WVNFS. While the treatment of 30 to 50 acres (12.14 to 20.23 ha) per year may seem minor when compared to the overall availability of 32,000 acres (12,949.94 ha) of suitable WVNFS habitat in the action area, this acreage is larger than, or represents a significant portion of the home range of an individual WVNFS. Telemetry data provide varying estimates of the size of individual WVNFS home ranges, but acreages of between 12 and 49 acres (4.86 and 19.83 ha) are common for females (Urban 1988, Menzel 2003). Home ranges for males are larger and have been reported to be from 68 to 199 acres (27.52 and 80.53 ha) (BHE 2003, Ford *et al.* 2007). Given these estimates, the proposed action could potentially result in the modification of the entire home range of an individual female WVNFS in one season. While the application of the conservation measures would help ensure that trees currently used for dens or nests are not removed or are not removed during the period that involant young are present, there are very little data available to evaluate how these proposed activities may affect feeding, breeding, and sheltering behavior of the WVNFS.

In contrast to the proposed non-commercial spruce restoration and timber stand improvement activities, these proposed commercial spruce restoration activities would result in the removal of both overstory and mid-story vegetation, and thus have a greater potential to significantly alter existing habitat conditions for the WVNFS. The MNF did not provide an analysis of the timeline required to improve habitat conditions, or the potential impacts of the prescription over time to the WVNFS. It may take decades to increase overstory spruce and return the area to the original or target overstory densities. While this proposed habitat improvement may represent a

short-term improvement in forestry timelines, this represents a multiple-generational time frame in the context of a species with an expected life span of four years. Stands treated could be unavailable or potentially become less suitable for WVNFS feeding and sheltering during the time that it takes for desired habitat conditions to develop. One peer reviewer noted that in order to fully evaluate potential effects, more detailed stand prescriptions that include retained over and understory basal area by species and specific targets for species composition and structural diversity should be developed.

In addition, the MNF did not provide research citations that would allow for a more detailed analysis of how the habitat conditions that would be immediately created would be similar to those known to be used by the WVNFS.

A more detailed evaluation of current versus resulting habitat conditions would also provide more justification to show that the proposed action would not adversely affect factors such as predation risk. For example, connectivity among tree crowns and development of mid-story vegetation facilitates travel between denning and foraging areas and may also provide protection from predation (Carey *et al.* 1999). Removal of up to 1/3 of the overstory, coupled with unspecified removal of midstory vegetation, could temporarily increase susceptibility of WVNFS to predation, particularly if target levels for vegetation removal are not clearly defined. Finally, some of the measures recommended in this treatment are based on modeling of expected forestry responses, and field application of these techniques has not been fully tested or monitored, particularly in regard to anticipated WVNFS responses. Therefore, a more cautious approach of targeted application, monitoring, and adaptive management would provide for further validation and quantification of expected benefits and/or potential adverse effects to the WVNFS.

Although the proposed activity could have long-term beneficial effects to the quality of the WVNFS habitat over time, there is the potential that this activity could have short-term adverse impacts on the WVNFS. As defined in the Final Endangered Species Act Section 7 Consultation Handbook (Service 1998), “in the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects,” the appropriate conclusion is that the proposed action “is likely to adversely affect” the listed species. The MNF determined that the removal of overstory trees and commercial spruce restoration activities “may affect”, but are not “likely to adversely affect” WVNFS. However, the Service does not concur with the MNF determination. The measures proposed to minimize adverse impacts to the WVNFS may not be sufficient or adequate to result in a discountable level of impacts to the WVNFS. We recommended that the MNF not conduct this activity within suitable WVNFS habitat. The MNF agreed to drop the proposed commercial spruce restoration activity from the proposed UGN Project.

Road and Trail Decommissioning

The MNF proposes to conduct 68.8 miles (110.72 km) of road and trail decommissioning within suitable WVNFS habitat. The roads and trails are a source of erosion and sedimentation and are contributing to degraded watershed conditions. The continued maintenance of unneeded roads and trails also fragments habitat and impedes the ability of these areas to regenerate into forested habitats that would support the WVNFS. As such, the decommissioning of roads and trails

within the action area would ultimately improve habitat for the WVNFS. However, in the short-term road and trail decommissioning could involve the disturbance of habitat and the removal of trees used by the WVNFS. The amount of work associated with each segment of road and trail decommissioning can vary from simply blocking access which would result in no habitat disturbance, to a full regrade and recontour of the roadbed which could involve disturbance to the road bed as well as to some areas immediately upslope and downslope of the road.

The MNF is not able to precisely quantify the number of acres that may be impacted from these activities because detailed project designs and engineering plans have not been developed for all sites. However, as of January 23, 2012, the MNF has evaluated approximately 44 miles (70.81 km) of the roads and trails proposed for decommissioning and quantified the percent of the roads and trails with tree cover, the amount of spruce present, and whether or not work involving active habitat disturbance will be needed. This analysis documented that no work or habitat disturbance will be needed on approximately 10 miles (16.09 km), and that there is minimal to no spruce or trees present in either the under or overstory on an additional 24.6 miles (39.59 km). Conducting work in these types of areas should not result in the disturbance or removal of a significant amount of habitat or trees potentially used by the WVNFS, particularly when conducted in conjunction with the avoidance measures included in the proposed action. This indicates that there should be minimal impacts to the WVNFS or its habitat as a result of road and trail decommissioning on a minimum of the total miles proposed, or 80 percent of the miles evaluated to date. The maximum length of any one road section in suitable WVNFS habitat that could have more than minimal spruce or tree cover is 1.78 miles (2.86 km), and most road lengths are significantly less. These activities are scattered throughout the action area and because they are narrow and linear, potential effects would not be concentrated in one area or in the potential home range of an individual WVNFS.

In addition to the conservation measures of avoiding large trees, or cutting trees when immobile young are not present, the MNF has also included a design feature into the UGN Project (EA, Chapter 2, page 27), that states "In MP 4.1, road decommissioning should avoid impacting pole or sawtimber-sized spruce trees to the maximum extent practical. Where seedling or sapling spruce occur on the road prism, but are scarce in the surrounding forest, impacts should be minimized to the extent practical." These design features should further ensure that impacts to both large and small spruce trees, and suitable WVNFS habitat, from individual road decommissioning projects will be minimal. In addition, the MNF also proposed where possible, to plant or replant young spruce in affected areas after road and trail decommissioning is complete. This will decrease the amount of time needed for the areas to naturally regenerate into forested habitat and increase the probability that the regenerated forest would have a species composition suitable to the WVNFS. As a result, it is anticipated that adverse effects from individual road and trail decommissioning projects will be insignificant.

By strategically planning the location(s) and by limiting the amount of habitat disturbance associated with road and trail decommissioning occurring within WVNFS suitable habitat each year, coupled with the implementation of the recommended conservation measures, the MNF further ensures that the cumulative disturbance will be discountable at any time and spread over the 86,500 acre (35,005.31 ha) action area as to not reach the level of disturbing the feeding, breeding, or sheltering of any individual WVNFS and would not significantly reduce the amount of habitat available to the WVNFS. We, therefore, recommended that the MNF conduct no more

than five miles (8.05 km) per year of active decommissioning on road or trail segments that have moderate to dense spruce present, using the categories as depicted in the January 23, 2012, analysis. Decommissioning that involves no disturbance, and thus results in no affect, to potential habitat for WVNFS is exempt from this limit. The MNF has committed to implementing this recommendation in conjunction with strict compliance to the avoidance and minimization measures previously proposed in the 2006 BO. The Service anticipates the cumulative amount of WVNFS habitat affected should be minimal, and concurs with the MNF determination that these activities “may affect”, but are “not likely to adversely affect” the WVNFS. The MNF should ensure that any contractors or staff conducting the work are aware of and are required to implement these measures, and that the proposed conservation measures, particularly the designing of projects so that removal of large trees is avoided and minimized, are strictly enforced.

Aquatic Passage and Riparian Restoration

The MNF proposed to conduct aquatic passage restoration at 39 sites within suitable WVNFS habitat. At these sites the MNF will repair, replace, or remove road-related structures (i.e., culverts) that are impairing stream habitat or connectivity. The MNF has not been able to precisely quantify the number of acres that may be impacted from these activities because detailed project designs and engineering plans have not been developed for the sites. However, the Service has reviewed site photographs and discussed the potential scope of activities with staff from the MNF. Because these projects are all associated with stream barriers related to roads, disturbances will, in most cases, be confined to the work done within existing roadways and will typically consist of the removal of previously placed structures or fill, and potential restoration of streambanks at risk of imminent failure. Terrestrial habitats that may be affected are typically composed of herbaceous vegetation and scattered small saplings. Very few large trees are present within these areas, and if present, they are typically located in riparian areas outside of the footprint of the road or fill. Although MNF staff are not aware of any currently proposed projects that would require contractors to clear habitat outside the existing roadways in order to remove or repair the structures causing stream blockages, they are aware of previous situations where this has occurred, resulting in disturbances of “up to ½ acre per site” as described in the BA.

To ensure that the amount of disturbance to WVNFS habitat is minimal, the MNF has committed to and shall include a condition requiring that any terrestrial or riparian disturbances associated with this work shall, to the extent practicable, be confined to the footprint of existing roads and associated fills, or to streambanks that are at risk of imminent failure. If engineering evaluations determine it is not possible to stay within the existing right-of-way (ROW) at a particular site, the MNF may allow the contractor to clear a maximum of 0.25 acres (0.10 ha) outside the ROW at any given site. However, this work shall not affect more than an average of 0.10 acre (0.04 ha) of land outside the existing ROW for all 39 sites.

The MNF committed to incorporate these recommendations in conjunction with the previously proposed avoidance and minimization measures in the 2006 BO in order to minimize impacts to the WVNFS. The MNF should ensure that any contractors or staff conducting the work are

aware of and are required to implement these recommendations, and that the proposed conservation measures to avoid and minimize large tree removal are incorporated in the project design phase and are strictly enforced.

In addition, the MNF proposed to conduct aquatic and riparian restoration activities throughout the UGN Project area. These activities would improve aquatic habitat in streams by delivering large wood and structure to stream channels by felling nearby trees into the channel, or transporting and placing large wood into the channel. Up to 53 trees per mile may be put into a given stream, depending on the quality of habitat already present in the stream. Trees would also be planted in areas where riparian habitat was lacking. This would improve the quality and quantity of aquatic and riparian habitat in the action area. The MNF has significant flexibility in selecting the source type of tree species used for this activity, and can strategically select trees from locations that would not impact other resources. No snags, obvious den trees or trees with cavities, spruce trees, healthy hemlock, other species with over-riding issues, or trees that would open up the canopy too much or otherwise impact shade too much would be selected for felling under this activity. The MNF determined that the proposed aquatic passage and riparian restoration activities “may affect”, but are “not likely to adversely affect” the WVNFS. Given the limited number of trees that will be used for this activity, and the avoidance measures that will be implemented, the Service concurs with the MNF determination.

Summary

In summary, the MNF requested Endangered Species Act section 7 informal consultation and concurrence on five proposed actions within WVNFS habitat, including non-commercial spruce restoration, non-commercial timber stand improvement, removal of overstory trees and commercial spruce restoration, road and trail decommissioning, and aquatic passage and riparian restoration. The MNF determined each of these proposed actions “may affect”, but is “not likely to adversely affect” the WVNFS and its habitat.

The Service developed recommendations for two of the five proposed actions pertaining to road and trail decommissioning and aquatic passage and riparian restoration to minimize potential impacts to the WVNFS and its habitat. The MNF reviewed the recommendations, and committed to implementing these recommendations on February 14, 2012.

We do not concur with the MNF determination of “may affect, not likely to adversely affect” WVNFS for the removal of overstory trees and commercial spruce restoration. The MNF committed to drop this proposed action on February 14, 2012.

We concur with the MNF determinations that each of the remaining four proposed actions (i.e., non-commercial spruce restoration, non-commercial timber stand improvement, road and trail decommissioning, and aquatic passage and riparian restoration actions) “may affect”, but are “not likely to adversely affect” WVNFS or its habitat. Should project plans change, or if additional information on listed and proposed species of concern becomes available, this determination may be reconsidered.

We commend the MNF for the proactive incorporation of significant activities designed to benefit the WVNFS. We anticipate these measures will contribute to the long-term management and enhancement of the WVNFS and the ecosystem on which it depends.

LITERATURE CITED

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Enclosure 2

Final Tier II Biological Opinion for the Upper Greenbrier North Project Located on the Greenbrier Ranger District of the Monongahela National Forest, Pocahontas County, West Virginia

This document is in response to your August 17, 2011, Biological Assessment (BA) and request for a site-specific review of multiple proposed actions batched under the Upper Greenbrier North (UGN) Project located on the Greenbrier Ranger District of the Monongahela National Forest (MNF) in Pocahontas County, West Virginia. The following comments are provided pursuant to the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

In July 2006, the U.S. Fish and Wildlife Service (Service) issued a programmatic Biological Opinion (BO) for the proposed 2006 Forest Plan Revision (FPR), of the Monongahela National Forest Land and Resource Management Plan (Forest Plan) (Service 2006). The programmatic BO established a two-tiered consultation process for Forest Plan activities, whereby the MNF develops proposed activities and determines whether the proposed action may affect listed species or designated critical habitat. The Service subsequently reviews the proposed site-specific actions to ascertain if any effects will occur as a result of a site-specific project in a manner, or to an extent, not evaluated or previously disclosed and discussed in the Service's 2006 programmatic BO. We consider this site-specific project analysis for the proposed UGN Project area to be a "Tier II" of the consultation process, with the programmatic consultation (and resulting 2006 BO) constituting the "Tier I" consultation. Our project-specific (Tier II) consultation focuses on: 1) compliance with reasonable and prudent measures and associated terms and conditions in the 2006 programmatic BO; 2) consistency with the scope and effects previously analyzed and disclosed in the programmatic BO and associated Biological Evaluation (BE); 3) project-specific incidental take vs. take estimated in the programmatic BO; and 4) project-specific reasonable and prudent measures and associated terms and conditions (i.e., for non-jeopardy determinations). In the event the MNF makes a determination of a "may affect, not likely to adversely affect" for a proposed specific action that is consistent with the 2006 programmatic BO, and the Service concurs, no further evaluation by the Service is necessary and section 7(a)(2) consultation will be considered complete for that proposed project. The Service will send a concurrence letter documenting the conclusion of informal consultation. In the 2006 programmatic consultation, the MNF determined the proposed actions "may affect, likely to adversely affect" the Indiana bat (*Myotis sodalis*). The MNF also determined these same proposed actions "may affect, not likely to adversely affect" for all other potentially affected Federally-listed species.

Consultation History

The Service has met or had discussions with the MNF numerous times during the early planning phases of the proposed Tier II UGN Project. In a letter dated March 24, 2011, the MNF provided a draft Biological Assessment (BA) that evaluated the effects of the proposed project on Federally-listed species. On April 8, 2011, the Service met with the MNF to discuss the implications of the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*)

(WVNFS) relisting on plans for this project. In a letter dated May 4, 2011, the MNF requested the Service's review of an addendum to the draft BA which included an affects analysis for the WVNFS. The Service met with representatives from the MNF on June 27, 2011, to discuss our comments on the draft BA and addendum. In a letter dated August 17, 2011, the MNF provided a revised BA and requested that the Service review the final BA and concur with MNF determinations of "no effect" for the Federally-listed species Cheat Mountain salamander (*Phethodon nettingi*) and shale barren rock cress (*Arabis serotina*), and determinations of "may affect, not likely to adversely affect" for the Virginia big-eared bat (*Corynorhinus townsendii virginianus*), running buffalo clover (*Trifolium stoloniferum*), Virginia spiraea (*Spiraea virginiana*), West Virginia northern flying squirrel, and small whorled pogonia (*Isotria medeoloides*). The MNF also requested initiation of formal consultation on the Indiana bat under the Tier II process described in the 2006 programmatic BO (Service 2006).

While the Service is not required to consult on "determinations of no effect", the MNF requested concurrence that the proposed UGN Project actions will have "no effect" on the Cheat Mountain Salamander and shale barren rock cress. The Service agrees. Therefore, these species will receive no further consideration in this document.

Species Not Likely To Be Adversely Affected

Overview

We have reviewed the information contained in the August 17, 2011, BA for the proposed UGN Project, as well as results of various surveys conducted in the project area. Surveys for listed plants were conducted in all proposed activity areas that would involve soil disturbance, broadcast herbicide application and/or removal of 20 percent or more of the overstory in mature tree stands. Field surveys covering the areas proposed for commercial timber harvest, new road construction, road and trail decommissioning, skid trail and landing construction, and recreation site improvement were also conducted. Surveys were conducted by experienced MNF botanists and consisted of meandering inspections through the proposed activity areas. Field surveys were conducted during the summers of 2008, 2009, and 2010. All surveys were conducted between June 1 and September 30, inclusive, which constitutes the active growing season for listed plants that are known to occur on the MNF.

Running buffalo clover

Running buffalo clover is a species that has shown great recovery potential if habitat is protected and managed. This species occurs in mesic habitats with partial to filtered sunlight, where there is a prolonged pattern of moderate, periodic disturbance, such as mowing, trampling, or grazing. It is most often, but not exclusively found in regions underlain with limestone or other calcareous bedrock. The MNF is a stronghold for running buffalo clover, with the largest and highest quality populations range-wide occurring on the MNF (Service 2007a). Most of the MNF's populations are associated with old skid trails, lightly used roads, or other features that cause moderate soil disturbance. Per direction in the Forest Plan, botanical surveys in high probability running buffalo clover habitat were conducted between June 1 and August 15. High probability running buffalo clover habitat consists of areas with base cation-rich substrates, as depicted on geologic mapping of the state of West Virginia. No populations of running buffalo clover were found. Based on the results of these surveys the potential for direct or indirect impacts is

minimal to the species. Therefore, the Service concurs with the MNF determination that the proposed UGN actions “may affect”, but are “not likely to adversely affect” running buffalo clover.

Virginia spiraea

Virginia spiraea is a clonal shrub found on damp, rocky banks of large, high-gradient streams (Service 1992). Potential habitat for Virginia spiraea within the proposed project area boundary is limited to the channels and banks of large streams such as the West Fork of the Greenbrier River, the East Fork of the Greenbrier River, and the Little River of the West Fork. However, Virginia spiraea is not known to occur along any streams in or near the UGN Project area. The potential for direct or indirect impacts to this species is discountable because most of the activities proposed by the action alternatives would not occur in or near potential habitat for Virginia spiraea, which consists of the banks of the largest streams. In addition, field surveys documented that there is a low likelihood of occurrence in the action area. Therefore, the Service concurs with the MNF’s determination that the proposed UGN actions “may affect”, but are “not likely to adversely affect” Virginia spiraea.

Small whorled pogonia

Habitat preferences for small whorled pogonia are poorly known, but could include a variety of forested habitats such as older hardwood stands of beech, birch, maple, oak, and hickory that have an open understory. Sometimes it grows in stands of softwoods such as hemlock (Service 2008). Small whorled pogonia is believed to prefer the type of partial canopy openings that could be created by felling trees for woody debris (Service 1992). The potential for direct or indirect effects is considered discountable because surveys of the proposed activity areas did not locate this species and small whorled pogonia is not known to occur in this part of the forest. Therefore, the Service concurs with the MNF’s determination that the proposed UGN actions “may affect”, but are “not likely to adversely affect” the small whorled pogonia.

Virginia big-eared bat

Virginia big-eared bats roost in caves and feed at night predominately on moths, but also on beetles, true flies, mosquitoes, bees, wasps, and ants (Forest Service 2006). Virginia big-eared bats generally forage within six miles (9.65 kilometers [km]) of their summer caves. In West Virginia, Virginia big-eared bats have been documented foraging in hay fields, forests, old fields and riparian corridors. Mist net surveys have been conducted during the maternity period throughout the project area over the last several years. Sites were surveyed in 1998, 2003, 2004, 2007, 2008, 2009 and 2010. Mist net site selection was selected based on quality of bat habitat in a given area rather than being limited to the specific area proposed to be affected. To date, a total of 410 bats of 7 different species have been captured. No Virginia big-eared bats have been captured during mist net surveys in the project area. There are no known maternity colonies within six miles (9.65 km) of the project area. Based on the absence of any Virginia big-eared bat captures or potential foraging areas around maternity caves within the action area, the MNF determined that implementation of any proposed UGN action “may affect”, but is “not likely to adversely affect” the Virginia big-eared bat either directly or indirectly. The Service concurs with the MNF’s determination that the proposed actions “may affect”, but are “not likely to adversely affect” Virginia big-eared bats.

As detailed above, we concur with the MNF's determinations of "may affect", but are "not likely to adversely affect" for the running buffalo clover, Virginia spiraea, small whorled pogonia and Virginia big-eared bat. With regard to these species, the proposed UGN actions will not result in effects exceeding, in manner or extent, those previously evaluated, disclosed and discussed in the 2006 programmatic BO and associated Forest Plan, and UGN BA. If, during the course of proposed or future forest management activities, including surveys of potentially suitable habitats, any of these species are found to occupy new locations on the MNF, the MNF should consult with the Service's West Virginia Field Office prior to implementing any activities.

Species Likely To Be Adversely Affected

As described in the Service's 2006 programmatic BO, adverse impacts are likely to occur to the Indiana bat from harvesting or tree removal under the MNF's management program activities. Therefore, given the nature of activities associated with the proposed UGN Project, we agree with your assessment that incidental take of Indiana bats is reasonably likely within the action area, and have provided this draft Tier II BO to address the potential adverse effects.

FINAL BIOLOGICAL OPINION

Description of the Proposed Action

The MNF has prepared an Environmental Assessment (EA) proposing a variety of activities for implementation over an estimated ten years in the UGN action area. The MNF proposed to implement the EA Preferred Alternative (Alt 5), as described in the UGN EA, dated August 17, 2011. The UGN proposal calls for implementing tree removal, prescribed burning, and herbicide use while conducting the following activities: non-commercial and commercial treatment for spruce restoration; non-commercial and commercial timber harvesting and thinning for timber and wildlife stand improvement; non-native invasive species treatment; road work related to timber harvest and watershed restoration; road and trail decommissioning for watershed restoration; restoration of aquatic and riparian habitat and aquatic passage; and recreation improvements.

Locations

Vegetation treatments such as non-commercial and commercial timber harvest, and thinning for timber and wildlife stand improvement and spruce restoration are proposed for implementation in 25 compartments in the northwestern and northeastern parts of the Upper Greenbrier River Watershed that are located north of Highway 250 and northwest of Highway 28. In addition, prescribed burning, aquatic, watershed, and recreation improvement projects such as road and trail decommissioning, road maintenance, aquatic passage and riparian restoration, non-native invasive species treatment, trail relocation, campground improvement, and dispersed recreation site impact reduction are proposed for implementation throughout the Upper Greenbrier River Watershed.

Action Area

The proposed actions are located near the towns of Durbin, Frank, and Bartow, West Virginia at the southern end of the UGN Project area. The boundary of Pocahontas and Randolph counties follows the drainage divide between the Greenbrier Watershed and the Laurel Fork and Dry Fork

watersheds, and forms the northern boundary of the UGN Project area. Shavers Mountain borders the area to the west, and the West Virginia/Virginia state line forms the eastern boundary. The project area encompasses four 6th level sub-watersheds: Little River, Headwaters East Fork Greenbrier River, West Fork Greenbrier River and Outlet East Fork Greenbrier River. These sub-watersheds are referred to as the Upper Greenbrier River watershed. The UGN Project area encompasses a total of 86,500 acres (35,005 hectare [ha]) including an estimated 69,600 acres (28,166 ha) (81 percent) of National Forest System (NFS) lands, and 15,800 acres (6,394 ha) (19 percent) of private lands. Approximately 200 acres (81 ha) adjacent to the northern boundary of the project area, in the Upper Laurel Fork drainage, are also included in the Project area to allow for spruce restoration, because that area could not easily be included in another project. The UGN Project area is dominated by late successional stands. Approximately 74 percent of the stands in the project area are greater than 80 years old, while only 3 percent of the stands are less than 19 years old (early successional habitat). The majority of the project area consists of mature saw timber sized mixed oak and mixed hardwood forests that are closed canopy, between approximately 60 and 104 years old.

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. For this BO, the action area includes the 86,500 total acres (35,005 total ha) within the UGN Project area plus any Indiana bat hibernacula located either within or outside the UGN Project area, or that has at least a portion of the UGN Project area located within a five-mile (8 kilometers [km]) radius (swarming zone) of the cave. Bats using these caves could swarm or forage within the UGN Project area and could be affected by the proposed actions. One known Indiana bat hibernacula, Izaak Walton Cave, is located within five miles of the UGN Project boundary.

Status of the Indiana Bat

The current status of the Indiana bat, its life history, and continued threats are thoroughly described in the 2006 programmatic BO (pages 27-43). This description remains current with the exception of the identification of a new threat, white-nose syndrome (WNS).

WNS has been characterized as a condition primarily affecting hibernating bats. Affected bats usually exhibit a white fungus on their muzzles and often on their wings and ears as well (Blehert *et. al.* 2009). Recently the fungus associated with WNS has been identified as a previously undescribed species of the genus *Geomyces* (named *G. destructans*) (Gargas *et.al.* 2009). The fungus thrives in the cold and humid conditions of bat hibernacula. The mode of transmission is primarily by bat-to-bat contact. In addition, people may unknowingly contribute to the spread of WNS by visiting affected caves and subsequently transporting fungal spores to unaffected caves. It is unclear how long symptoms take to manifest after exposure to the fungus. It is also unclear what the long-term effects to the Indiana bat will be (e.g., geographic spread, mortality within affected sites). Interestingly, *G. destructans* has been documented growing on hibernating bats in several European countries, but the fungus does not appear to be causing widespread mortality there (Puechmaille *et. al.* 2010).

Bats affected with WNS do not always have a grossly visible fungus, but may display abnormal behaviors. These behaviors include bats roosting towards the entrances of caves/mines where the temperatures and humidity are far less stable than traditional roosting sites. Affected bats are

also leaving their hibernacula and flying around during the day in cold temperatures far too early in the winter/spring before any insects are available for foraging. Many WNS-affected bats still inside hibernacula have not responded to human presence during surveys as healthy, unaffected bats do. Affected bats appear to be using up their essential fat reserves well before spring emergence.

WNS was first documented in a photograph taken in a New York cave in February 2006. As of October 2011, evidence of the syndrome has been documented in 18 states (New York, Massachusetts, Maryland, Delaware, Vermont, New Hampshire, Connecticut, Virginia, West Virginia, Pennsylvania, New Jersey, Oklahoma, Missouri, Ohio, Kentucky, Indiana, North Carolina, and Tennessee) and two Canadian Provinces, including many known Indiana bat hibernacula. In some affected hibernacula in New York and New England, 90 to 100% of the bats have died.

Service biologists and partners estimate that at least 5.7 million to 6.7 million bats have now died from WNS (Service 2012). The range-wide population of the Indiana bat has declined approximately 10 percent from 2007 to 2011 (Service 2011). The Northeast regional populations of Indiana bats, including West Virginia and five other states known to be affected by WNS, have declined 54 percent from 2007 to 2011 (Service 2011). See Figure 1 for a range-wide population estimate of the Indiana bat by region.

Currently, most WNS-associated mortality has occurred at sites within the proposed Northeast and Appalachian Mountain Recovery Unit (RU), but evidence of the fungus has been found at sites within the Midwest and Ozark Central RUs as well. Future monitoring should reveal the extent to which WNS will affect bats within these later two RUs. West Virginia is located in the Appalachian Mountain RU. Although populations in some states within this RU have declined almost 50 percent since 2009, overall populations within this RU have increased by 6.4 percent (Service 2011). See Figure 2 for a range-wide population estimate for the Indiana bat by RU.

WNS was first documented in West Virginia in 2009 at Trout Cave, Pendleton County. Since that time, WNS has been confirmed in caves in Greenbrier, Hardy, Mercer, Monroe, Pendleton, Tucker, Fayette, Randolph, Grant and Pocahontas counties (WVDNR 2011). In addition, a WNS-positive bat was found in Jefferson County, although no caves in that county have been confirmed positive. While winter hibernacula monitoring shows Indiana bat populations were decreasing in other portions of their range in recent decades, estimated winter populations in West Virginia have been increasing since the early 1980s (WVDNR 2011). Hibernating populations in West Virginia have increased from an estimated 6,500 since 1990 to 20,358 in 2011 which is the most recent year that full data is available (Service 2011b). However, based on data from three WNS-affected sites in West Virginia, 43 percent mortality of Indiana bats has already been observed. In addition, February 2011 entrance surveys at Hellhole, which supports the largest population of both Indiana and little brown bats in the state, documented over 400 bats flying out of the entrance in a one-hour period of the afternoon (WVDNR 2011). This indicates that significant mortality of the Indiana bat population can be expected in this cave as well. Continued monitoring in future years should provide more information on the extent of WNS-related impacts to populations in West Virginia and the Appalachian Mountain RU.

In summary, WNS has currently spread throughout many sites within the Indiana bat's range. Although most mortality has occurred at sites in the northeast, the degree of impact to bats within sites varies, and the observed impact among bat species varies. Given the information currently available, it is uncertain how the overall population of the Indiana bat will be affected over the long term. However, the range-wide population of the species has declined approximately 10 percent from 2007 to 2011. Winter counts in future years will provide valuable insights into the geographic spread and population level impacts. The Service, states, and multiple researchers are continuing to try to identify the cause of WNS and determine options for minimizing additional WNS-associated mortalities.

Environmental Baseline

The baseline conditions in relation to the Indiana bat and its habitat within the MNF are fully described in the 2006 BO (pages 39-40 and 43-47). These descriptions remain current with the following exceptions. Surveys were conducted during the summer of 2006 at the site of the suspected maternity colony in Pendleton County (page 39, 2006 BO). Emergence counts at the previously identified roost tree documented over 30 bats emerging from the tree; however subsequent mist netting in the area suggests that no maternity activity was occurring at the site. Rather, these surveys indicate that the tree and nearby areas were used by a bachelor colony of male Indiana bats (B. Douglas, C. Stihler, D. Arling, C. Sanders; personal observations, 2005). Additional mist net surveys conducted in the general area in 2008 did result in the capture of a post-lactating female Indiana bat. A transmitter was placed on this bat. She was tracked for several hours; however, despite extensive efforts, the bat could not be tracked to any roost tree the following day or thereafter. Nevertheless, the capture does provide evidence of a potential maternity roost in the area.

Additional surveys at the previously documented maternity colony on the MNF in Tucker County have also been conducted since the summer of 2006. While the roost trees used in previous years have become unsuitable, habitat reviews indicate that the area continues to provide a large number of potentially suitable maternity roost trees. Although numerous male Indiana bats have been captured, mist net surveys have not resulted in the capture of any additional female Indiana bats. These results indicate that Indiana bats continue to use the areas for roosting and foraging throughout the summer; however, it is not known whether a maternity colony still exists in the area.

Status of the Species within the Action Area

Over the last several years, mist-net surveys have been conducted during the maternity period to determine if Indiana bats are present within the UGN action area. Sites were surveyed in 1998, 2003, 2004, 2007, 2008, 2009, and 2010. Mist net sites were selected based on quality of bat habitat in a given area, instead of being limited to the specific area proposed to be affected. As of 2011, a total of 410 bats of seven species have been captured. Two adult male Indiana bats were captured under the Buffalo Fork Bridge, where the Little River flows beneath US-250/WV-28. The first capture occurred on June 28, 2004. On the first day following capture, this male was tracked to a live shagbark hickory in a wooded area southeast of the highway 0.5 miles (0.8

km) and northeast of FS 54 and the Little River, where it stayed for two days. On the third day, the bat roosted in a snag in a wetland directly adjacent and west of US-250, where it remained for several nights, eventually dropping the transmitter at that location.

The second capture occurred on June 20, 2010. That male was tracked to a roost tree in the Buffalo Fork floodplain approximately 0.5 miles (0.80 km) west of Buffalo lake 1.8 miles (2.90 km) from the capture location, where it used several different roost trees in the same area for the life of the transmitter. Emergence counts of those trees indicated many bats leaving several of the trees in the grouping. This suggests that this area may be a well-used foraging area.

Although the capture of Indiana bats confirms their presence, failure to catch bats does not absolutely confirm their absence. However, the Service generally accepts survey efforts as outlined in the mist-netting guidelines contained in the Indiana Bat Recovery Plan to determine presence for the purpose of section 7 consultation. While maternity activity could be present in or near the UGN Project area, the negative data from mist net surveys suggests that any Indiana bat maternity activity is so low that it cannot be detected via mist net surveys, and the likelihood that Indiana bat maternity colonies are present in the UGN action area is remote. However, male Indiana bats have been found twice in the same area (Buffalo Fork Bridge), suggesting some level of continual use in this area. Therefore, the MNF has established a two-mile (3.21 km) buffer around this area (capture and roost location) and designated it as a Zone of Immediate Concern (ZIC) for the Indiana bat.

According to the West Virginia Department of Natural Resources (WVDNR) data, there are four mapped caves within the boundaries of the UGN Project area. None have documented evidence of harboring Indiana bats. A fifth cave, the Izaak Walton Cave, is the closest known Indiana bat hibernaculum, and is located within five miles (8.0 km) of the boundaries of the UGN Project area, and is therefore included in the action area. Approximately 768 acres (310.80 ha) of the northeastern portion of the UGN Project area falls within the five-mile (8.04 km) primary swarming zone around Izaak Walton Cave. The most recent census of this cave, conducted in January 2008, documented a total of 414 bats present within the cave including 115 Indiana bats (WVDNR 2008).

While the presence of WNS has been confirmed in caves in Randolph and Pocahontas counties, it has yet to be detected in caves within the UGN action area. Entrance surveys conducted at Izaak Walton Cave in winter 2011 did not document any signs of WNS, such as dead bats around the entrance or bats flying around the entrance during the day. However, it is likely that caves within the action area may become infected with WNS within the life of the proposed UGN Project.

Effects of the Action

Tree Removal

The MNF proposes to conduct the following activities that could impact Indiana bat habitat by cutting trees that could be used by roosting Indiana bats: (1) commercial timber harvests totaling 2,726 acres (1,103 ha), which include 502 acres (203.15 ha) of clearcuts, 937 acres (379.19 ha) of shelterwood harvests, programmed thinning on 315 acres (127.47 ha), thinning for spruce

release on 877 acres (354.90 ha), and spruce hardwood regeneration on 95 acres (38.45 ha); and (2) associated road work, which includes 11.23 miles (18.07 km) of road construction for timber harvest, 86 acres (34.80 ha) of timber landing construction, and 118 miles (189.90 km) of road decommissioning. All these activities require some degree of tree removal, which could affect Indiana bats and their foraging and roosting habitat. Tree removal during the non-hibernation period (April 1 - November 14) may result in mortality (take) of roosting Indiana bats, if a tree containing a roosting bat is removed.

There are two portions of the UGN action area where Indiana bats are either known to be or are highly likely to be present: the swarming area around Izaak Walton Cave and the male roost areas around Buffalo Fork Bridge, as described in the "Status of the Species" section of this BO. Approximately 768 acres (310.80 ha) in the extreme northwest corner of the project area are within five miles (8.05 km) of Izaak Walton Cave. The only activities proposed to occur within this area are non-commercial spruce restoration on 162 acres (65.56 ha), timber stand improvement on 29 acres (11.74 km), and 0.8 miles (1.28 km) of road decommissioning. Road decommissioning and aquatic passage restoration are the only activities proposed to occur within the ZIC established around the Buffalo Fork Bridge male roosting area. For timber stand improvement and non-commercial spruce restoration within the primary range of Izaak Walton Cave, no trees greater than 5 inches (12.70 cm) diameter breast height (DBH) will be harvested. Pertaining to proposed road decommissioning activities in both areas, any trees greater than 5 inches (12.70 cm) DBH that need to be cut would be felled during the hibernation period (November 15 through March 31), thus avoiding direct take of listed species. Indiana bat roost trees are typically larger than 5 inches (12.70 cm) DBH (Service 2007b, Romme *et al.* 1995); therefore, by felling suitable bat roost trees located in the areas with the highest potential of being occupied by an Indiana bat during the hibernation season, incidental take of bats has been avoided.

Direct take of Indiana bats in the remainder of the project area could occur by implementing the proposed actions. For example, if a bat using a roost tree that is harvested is not killed during the removal, the roosting bat would be forced to find an alternative tree. This could result in a significant loss of energy that could harm or harass the individual bat. As noted in the "Status of the Species within the Action Area" section of this BO, negative mist net survey results suggest there is a low probability that Indiana bat maternity colonies are present within the UGN Project area. The potential for direct impacts is, therefore, likely restricted to males or bats roosting individually in trees. However, without completing additional bat surveys throughout the duration of the project, it is not possible to rule out the possibility that Indiana bats will be present in the area and potentially could be incidentally taken by the proposed actions. The potential effects of removing occupied roost trees and the measures that the MNF has incorporated to minimize this potential are more fully described in the 2006 programmatic BO (pages 51-53).

Habitat modifications due to implementation of the proposed actions would primarily involve loss of suitable roost trees. Impacts to habitat suitability and availability of roost trees will vary based on the type of the proposed activity. Shelterwood and clearcut harvests have the potential to affect potential foraging and roosting habitat by reducing canopy closure below optimal levels (Romme *et al.* 1995). In addition, potential roost trees would be removed and future roost tree

availability could be reduced by the removal of most of the large trees. The effect of potential roost tree loss would last several decades until trees in the regenerated areas reached roost tree size.

Commercial thinning may indirectly benefit Indiana bats by reducing canopy closure to a more optimal level for Indiana bat foraging. Opening up canopy cover may improve foraging as well as roosting conditions. This type of vegetation removal would enlarge existing canopy openings within the forested areas of each harvesting unit, which could improve roosting habitat by exposing more potential roost trees to sunlight. These effects are considered short-term because canopy closure occurs approximately five to ten years after thinning occurs. A more long-term effect of thinning is increased residual growth on the remaining trees, creating larger diameter and suitable roost trees. Thinning would reduce vegetative competition and promote larger, older trees and allow remaining hardwood trees to grow larger. Road construction and decommissioning could result in the removal of roost trees, but also could create suitable habitat because forest roads or small linear corridors with relatively high canopy closure provide foraging and traveling corridors for the Indiana bat.

Tree species composition within the harvesting units are comprised mostly of various hardwoods, with an emphasis on black cherry in the northern part of the UGN Project area and oak in the southern part of the project area. As noted in the programmatic BO, the exfoliating bark of certain hardwood trees such as hickories and large oaks often provide roost sites. Consistent with the Forest Plan (TE 24), the retention or creation of at least six snags and other den trees per acre will further increase the potential that a substantial number of potential roost trees within the project area will be maintained. Damage to residual trees during felling can also improve roosting quality and quantity as cavities and crevices are more likely to develop overtime due to resulting pathogen and insect attack at the injury points on the trees.

The proposed actions also could potentially affect Indiana bats indirectly by altering foraging habitat. For example, tree cutting associated with the proposed actions may slightly increase the amount of edge along forest-shrub-grass ecotones by opening the overstory and providing linear corridors. Relatively high use of linear landscape features similar to what would result from the proposed actions may create foraging habitat on a smaller scale due to increased insect abundance, more accessible prey, and reduced energetic demands associated with flight (Murray and Kurta 2004). In addition, the proposed aquatic restoration activities could enhance habitat characteristics along treated streams, by restoring riparian vegetation and enhancing production of aquatic emergent insects on which Indiana bats prey, resulting in beneficial effects to potential Indiana bat foraging habitats.

In conclusion, the potential impacts from the proposed UGN Project tree removal activities, including timber harvest, and road construction and decommissioning, as well as the effects to roosting bats and habitat suitability as discussed above, are consistent with the findings and are more fully described in the 2006 programmatic BO (pages 51-56).

Prescribed Burn

Approximately 610 acres (246.86 ha) are being proposed for a prescribed burn. Potential effects to Indiana bats include exposure to smoke and heat, and disturbance from noise/human presence.

Effects could occur if involant bats were present in the area during the prescribed burn. Conducting prescribed burning outside the hibernation period could result in direct mortality or injury to the Indiana bat caused by burning or smoke inhalation, especially death to young bats that are not volant. However, the likelihood of this happening is reduced because the burns will be conducted when involant young will not be present and all bats should be mobile during the burning activities. Because the proposed burns will be slow moving, most bats should have time to move out of the affected area. Indirect adverse effects in the form of harm and harassment of Indiana bats being forced to flee from roosting and foraging areas may result. However, these adverse effects are expected to be short-term and localized. In conclusion, the potential effects of prescribed fire from this project are consistent with the findings described in the 2006 programmatic BO (pages 57-59).

Herbicide Use

The MNF proposes to use herbicides during a number of proposed activities including timber stand improvement and commercial timber harvests. Multiple methods of herbicide application are proposed, including hand application with backpack systems, foliar broadcast mechanized spraying, and other more targeted methods as needed. The potential for effects from herbicide on Indiana bats is low because the proposed application rates of Glyphosate and Imazapyr are below levels that would indicate acute or chronic risks to mammals (SERA 2011a, SERA 2011b). In addition, with the exception of 50 acres (20.23 ha) of herbicide treatment within five miles (8.0 km) of Izaak Walton Cave, the MNF has avoided using herbicides in portions of the action area that have known or high probability of Indiana bat usage. One potential risk to Indiana bat would be from broadcast spraying negatively impacting insects, thereby reducing forage. However, impacts are expected to be minimal because of the small proportion of the project area being treated at one particular time, and because the herbicides proposed to be used degrade rapidly and do not bioaccumulate. The potential toxicity, half-life, and risks associated with the herbicides proposed to be used are more fully described in Appendix K of the UGN EA and associated citations. Thus, any effects would be temporary and localized. We conclude that no detrimental effects to Indiana bat are anticipated from herbicide use. Therefore, herbicide use, as proposed, “may affect”, but is “not likely to adversely affect” Indiana bats.

White-nose Syndrome

Although none of the caves within the UGN project action area are currently known to be affected by WNS, given the rapid broadscale spread of WNS in previous years, it is reasonable to expect that WNS will affect bats within the action area over the proposed ten year life of the project. Bats affected but not killed by WNS during hibernation may be weakened by the effects of the disease and may have extremely reduced fat reserves and damage to wing membranes. These effects may reduce their capability to fly or to survive long-distance migrations to summer roosting or maternity areas. Affected bats may also be more likely to stay closer to the hibernation site for a longer time period following spring emergence. Although it is not possible to quantify potential future effects from WNS on bats hibernating in the action area, the MNF has minimized potential disturbances in the portions of the action area where WNS-affected Indiana bats are most likely to be present, including swarming areas around hibernacula and known summer roosting and foraging areas around Buffalo Fork Bridge. With the exception of road decommissioning activities, no work involving the removal of Indiana bat roost trees would occur in these areas. All tree removal for road decommissioning within these areas will occur

between November 15 and March 31, when the bats are most likely to be in hibernation. As a result, the bats should still have the ability to emerge, forage in the area around the hibernacula, and potentially regain fat reserves and begin healing from wing membrane damage, without being disturbed or killed by the felling of occupied roost trees. The proposed aquatic habitat restoration projects should improve the quality of riparian and stream corridor foraging habitat for the Indiana bat. Thus, it is anticipated that the MNF's proposed activities, when evaluated in conjunction with their proposed conservation measures, should not reduce the ability of the action area to support hibernating or swarming Indiana bats, with or without the presence of WNS. The MNF will continue to monitor both Indiana bat hibernacula and summer usage patterns within the UGN Project area and will provide further information on the scope and type of effects that WNS has on bats both within the action area and throughout the range of the species.

Cumulative Effects

The 86,500-acre (35,005.31-ha) action area is comprised of 81 percent (69,600 acres [28,166.12 ha]) Forest Service (FS) lands and 19 percent (15,800 acres [6,394.03 ha]) private lands. At present, 5 percent (4311 acres [1744.60 ha]) of the project area is non-forested and the remaining 95 percent of the area is forested. Future Federal, State, local and private actions that are reasonably certain to occur within the MNF-owned portion of the action area will likely either be implemented by or require a permit from the MNF. These actions will require a section 7 consultation and, therefore, are not considered cumulative effects of the action. The foreseeable future activities on private lands within the action area are assumed to be similar to activities currently taking place in the UGN watershed. Additional development and disturbances such as timber sales may occur. However, neither the MNF nor the Service is aware of any specific plans or the extent of such activities, and it is assumed that land management would probably remain similar to what has been done in the past. The Service is not aware of any additional future State, local, or private actions that could occur within the action area that would not be subject to a section 7 review. The MNF is proposing to conduct some activities, such as clearcuts and road construction that will convert some areas from a primarily forested condition to a primarily non-forested condition. After implementation of the proposed action, it is anticipated that at least 92 percent of the action area, including the majority of the area affected by MNF activities, will remain in a primarily forested condition. Therefore, we do not anticipate cumulative effects, as defined in the ESA, to be significant within the action area.

The Service has determined that a significant cumulative reduction in population numbers of the Indiana bat will not occur in the project area for the following reasons: 1) the actions that are reasonably certain to occur and their cumulative effects are consistent with those identified and discussed in the 2006 programmatic BO; and 2) suitable Indiana bat habitat will continue to occur on a large percentage of the project area and action area.

Conclusion

The effects associated with the proposed activities for the UGN Project are consistent with those identified and discussed in the Service's 2006 programmatic BO. After reviewing the size and scope of the project, the environmental baseline, the overall status of the Indiana bat, new

information on the species, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the action is not likely to jeopardize the continued existence of the Indiana bat and that a significant cumulative reduction in population numbers of the Indiana bat will not occur from the proposed UGN Project actions because: 1) the project, although large scale, should not substantially affect the swarming, roosting or foraging habitat for the Indiana bat; 2) no known maternity areas are located in close proximity to the project; and 3) avoidance and minimization measures incorporated into the project have reduced the potential for removing roost trees and associated direct and indirect take of bats.

Incidental Take Statement

The Service anticipates that the proposed UGN actions pertaining to prescribed fire, timber harvest, and road construction and road decommissioning will result in the incidental take of the Indiana bat as outlined in Table 1. The type and amount of anticipated incidental take is consistent with that described in the 2006 programmatic BO and does not cause the total annual level of incidental take (via harm to forested acres) in the programmatic BO to be exceeded. The actual incidental take reported by the MNF has consistently been below the annual levels estimated (exempted) in the 2006 programmatic BO; therefore, we do not anticipate that implementation of these proposed actions will result in exceedance of the authorized take levels contained in the 2006 programmatic BO.

In addition, in conjunction with implementation of the 2006 BO Reasonable and Prudent Measures and Terms and Conditions, the MNF has committed to implement Service recommendations, conservation measures and forest-wide avoidance measures that, while associated with other site-specific proposed actions in the UGN Project area, contribute to minimizing potential impacts on the Indiana bat, and help to ensure the incidental take authorized in Table 1 is not exceeded and the UGN Project area will continue to provide potential foraging and roosting habitat to support Indiana bats.

All proposed activities fall within the scale and the scope addressed in the 2006 programmatic BO and within the level of take identified in the Incidental Take Statement. If future monitoring conducted on the MNF identifies additional evidence of Indiana bats utilizing the project area, the MNF will consult with the Service and the WVDNR to develop further protective measures in accordance with the MNF Forest Plan and the 2006 programmatic BO.

Table 1: Authorized incidental take anticipated due to the removal or disturbance of potential Indiana bat habitat on the Monongahela National Forest, FY 2011-2012.

Activity	UGN Project	Annual Incidental Take Authorized for Forested Access per Tier I BO
Prescribed Fire	610 acres (246.85 ha)	3000 acres (1,214.05 ha)
Timber Harvest	2,726 acres (1,103.17 ha)	6,900 acres (2792.33 ha)
Road Construction and Road Decommissioning	129.4 miles (207.60 km) not to exceed 78 acres (31.56 ha)	78 acres (31.56 ha)
Total	3,336 acres (1,350.03 ha) and 129.4 miles (207.60 km)	9,978 acres (4,037.95 ha)

*The annual allowable take for road activities (including road decommissioning, new construction, and skid trails) for the MNF is 78 acres (31.56 ha). The amount of road activities will be estimated and reported on a yearly basis. For the proposed UGN actions, the total amount of new road construction is 8.4 miles (13.51 km) and 121 miles (194.73 km) of road decommissioning. Although the amount of skid trails proposed is 60 miles (96.6 km), the vast majority of skid trails are inside the timber unit boundaries (already counted). The MNF will monitor the total acreage of road related activities both forest-wide and for the proposed UGN actions. If tree removal associated with proposed road decommissioning for a given year, combined with other road activities, is anticipated to exceed the annual allotted acreage, tree removal for road decommissioning would occur during the bat hibernation period (November 15 through March 31). This design feature can be found in the UGN draft EA (Chapter 2, page 32) and is consistent with the 2006 programmatic BO (Reasonable and Prudent Measure 1.7). In addition, the annual total amount of forest-wide road-related work conducted since issuance of the 2006 programmatic BO has not exceeded 15.5 acres (6.27 ha) per year, and the cumulative total of road-related actions implemented from 2007 through 2011 is 38.3 acres (15.50 ha). Therefore, it is unlikely that the annual or cumulative total amount of incidental take for this activity will be exceeded.

Please note that as per the Terms and Conditions of the 2006 BO this draft Tier II BO will also track the amount of incidental take authorized. However, incidental take does not actually occur until the time the project is implemented. Most projects authorized under this draft Tier II BO will not be implemented for a number of years; therefore the MNF must annually report the total amount of incidental take that occurs each year and for each project. This number will be compared to the maximum annual incidental take as authorized in the 2006 programmatic BO. If

it is determined during future project planning or the course of project implementation that either the authorized amount of project specific incidental take as detailed above, or the maximum amount of annual incidental take as detailed in the programmatic BO, may be exceeded, additional consultation with the Service will be required.

Reasonable and Prudent Measures

The 2006 Tier I Programmatic BO contained reasonable and prudent measures pertaining to the initial consultation documents. In this Tier II consultation, the Service believes the following (and additional) reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of Indiana bat from the proposed UGN Project actions also referenced in the MNF Alternative 5:

1. The MNF will implement site-specific avoidance and conservation measures as proposed in the August 2011 UGN Project Area Biological Assessment pertaining to timber harvest, road construction/maintenance, non-native invasive species control, and prescribed burn activities consistent with Alternative 5 as described in the Biological Assessment.

Terms and Conditions

In order to be exempt from the prohibition of Section 9 of the ESA, the MNF must comply with the terms and conditions in the 2006 programmatic BO as well as the following additional terms and conditions, which implement the reasonable and prudent measures described in the 2006 programmatic BO and RPMs above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1.
 - A. The MNF shall cut no vegetation greater than five inches (12.7 cm) DBH during timber stand improvement and non-commercial spruce restoration activities conducted within five miles (8.0 km) of Izaak Walton Cave.
 - B. The MNF shall cut trees greater than five inches (12.7 cm) DBH and required for road decommissioning activities within five miles (8.0 km) of Izaak Walton Cave, or within two miles (3.21 km) of the Buffalo Fork Bridge Indiana bat capture and roost area, between November 15 and March 31 when the bats are in hibernation.
 - C. The MNF shall monitor and report the totals to the Service's West Virginia Field Office annually by November 15. If the amount of tree removal associated with road-related activities, including road decommissioning and road construction, for the proposed UGN Project actions in a given year, when combined with all other road activities on the MNF, is anticipated to exceed the annual allowable acreage of 78 acres (31.56 ha), then tree removal for any acreage above 78 acres (31.56 ha) shall occur between November 15 and March 31 when the bats are in hibernation.
 - D. The MNF, in cooperation with the Service and the WVDNR, shall continue to monitor the status of the Indiana bat on Forest Service land.

- E. The MNF shall monitor tree removal activities and prescribed burning on Forest Service lands to determine whether measures to protect the Indiana bat, and the terms and conditions of the BO are being implemented as required.

Reinitiation Notice

Incidental take that occurs as a result of this and other projects on the MNF cannot exceed the annual or cumulative incidental take levels established in the 2006 programmatic Tier I BO. If implementation of any project or projects is anticipated to exceed these take levels, further consultation with the Service will be necessary. To ensure that incidental take is not exceeded, the MNF shall provide annual reports to the West Virginia Field Office tabulating the amount of incidental take on projects being implemented and authorized throughout the MNF, as indirectly measured by acres affected.

This concludes formal consultation for the MNF proposed UGN Project actions as described above. No further section 7 consultation will be necessary except if any reinitiation criteria as described in the 2006 programmatic BO are met. Should new information reveal effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; or the proposed agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or a new species is listed or critical habitat is designated that may be affected by the action; or the amount or extent of incidental take identified in Table 1 is exceeded, reinitiation of formal consultation as outlined in 50 C.F.R. 402.16 is required.

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Figure 1: 2011 Range-wide Population Estimate for the Indiana Bat by Service Region

Estimates are primarily based on winter surveys conducted in January and February of 2011 at known Priority 1 & 2 hibernacula throughout the species' range. Additional data from Priority 3 and 4 hibernacula were included when available.

USFWS Region	State	2003	2005	2007	2009	2011	% Change from 2009	% of 2011 Total
Region 2	Oklahoma	5	2	0	0	13	100%	0.0%
Region 3	Indiana	183,337	206,610	238,068	213,170	222,820	4.5%	52.5%
	Illinois	43,647	55,090	53,923	53,342	55,956	4.9%	13.2%
	Missouri	17,752	16,102	15,895	13,688	13,647	-0.3%	3.2%
	Ohio	9,831	9,769	7,829	9,261	9,870	6.6%	2.3%
	Michigan	20	20	20	20	20	0.0%	0.0%
	Total	254,587	287,591	315,435	289,481	302,313	4.4%	71.2%
Region 4	Kentucky	49,544	65,611	71,250	57,325	70,329	22.7%	16.6%
	Tennessee	9,802	12,074	8,906	12,721	12,786	0.5%	3.0%
	Arkansas	2,228	2,067	1,829	1,480	1,206	-18.5%	0.3%
	Alabama	265	296	258	253	261	3.2%	0.1%
	North Carolina	0	0	0	1	1	0.0%	0.0%
	Total	61,839	80,048	82,243	71,780	84,583	17.8%	19.9%
Region 5	West Virginia	11,443	13,417	14,745	17,965	20,358	13.3%	4.8%
	New York	32,529	41,745	52,779	34,045	16,052	-52.9%	3.8%
	Virginia	1,158	769	723	730	863	18.2%	0.2%
	Pennsylvania	931	835	1,038	1,031	518	-49.8%	0.1%
	New Jersey	644	652	659	416	5	-98.8%	0.0%
	Vermont	472	313	325	64	3	-95.3%	0.0%
		Total	47,177	57,731	70,269	54,251	37,799	-30.3%
Rangewide Total:		363,608	425,372	467,947	415,512	424,708	2.2%	100.0%
2-yr. Net Change:			61,764	42,575	-52,435	9,196		
2-yr. % Change:			17.0%	10.0%	-11.2%	2.2%		

Compiled by Andy King (andrew_king@fws.gov), U.S. Fish and Wildlife Service, Bloomington, Indiana, Ecological Services Field Office from data gathered from bat biologists throughout the species' range.

Figure 2: 2011 Range-wide Population Estimate for the Indiana Bat by RU

Estimates are primarily based on winter surveys conducted in January and February of 2011 at known Priority 1 & 2 hibernacula throughout the species' range. Additional data from Priority 3 and 4 hibernacula were included when available

IBat Recovery Unit	State	2003	2005	2007	2009	2011	% Change from 2009	% of 2011 Total
Ozark-Central	Illinois	43,647	55,090	53,823	53,342	55,956	4.9%	13.2%
	Missouri	17,752	16,102	15,895	13,688	13,647	-0.3%	3.2%
	Arkansas	2,228	2,067	1,829	1,480	1,206	-18.5%	0.3%
	Oklahoma	5	2	0	0	13	0.0%	0.0%
	Total	63,632	73,261	71,547	68,510	70,822	3.4%	16.7%
Midwest	Indiana	183,337	206,610	238,068	213,170	222,820	4.5%	52.5%
	Kentucky	49,544	65,611	71,250	57,325	70,329	22.7%	16.6%
	Ohio	9,831	9,769	7,629	9,261	9,870	6.6%	2.3%
	Tennessee	3,246	3,221	2,929	1,663	1,690	1.6%	0.4%
	Alabama	265	296	258	253	261	3.2%	0.1%
	SW Virginia	430	202	188	217	307	41.5%	0.1%
	Michigan	20	20	20	20	20	0.0%	0.0%
	Total	246,673	285,729	320,342	281,909	305,297	8.3%	71.9%
Appalachian	West Virginia	11,443	13,417	14,745	17,965	20,358	13.3%	4.8%
	E. Tennessee	6,556	8,853	5,977	11,058	11,096	0.3%	2.6%
	Pennsylvania	931	835	1,038	1,031	518	-49.8%	0.1%
	Virginia	728	567	535	513	550	8.4%	0.1%
	North Carolina	0	0	0	1	1	0.0%	0.0%
	Total	19,658	23,672	22,295	30,568	32,524	6.4%	7.7%
Northeast	New York	32,529	41,745	52,779	34,045	16,052	-52.9%	3.8%
	New Jersey	644	652	659	416	5	-98.8%	0.0%
	Vermont	472	313	325	64	3	-95.3%	0.0%
	Total	33,645	42,710	53,763	34,525	16,060	-53.0%	3.8%
Rangewide Total:		363,608	425,372	467,947	415,512	424,708	2.2%	100.0%
2-yr. Net Change:		61,764	42,575	-52,435	9,186			
2-yr. % Change:		17.0%	10.0%	-11.2%	2.2%			

Compiled by Andy King (andrew_king@fws.gov), U.S. Fish and Wildlife Service, Bloomington, Indiana, Ecological Services Field Office from data gathered from bat biologists throughout the species' range.