

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

March 15, 2005

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

Re: Desert Branch Project, Gauley Ranger District

Dear Mr. Thompson:

This letter is in response to your request, dated September 10, 2004, for a site-specific review of the proposed Desert Branch Project on the Gauley Ranger District, Monongahela National Forest (MNF) in Nicholas and Greenbrier counties, 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.

On March 26, 2002, the U.S. Fish and Wildlife Service (Service) issued a programmatic Biological Opinion (programmatic BO) for the continued implementation of the 1986 (as amended) Monongahela National Forest Land and Resource Management Plan (Forest Plan). This programmatic BO established a two-tiered consultation process for Forest Plan activities, where the Service will review, as they are developed, site-specific projects that may affect federally listed species. The Service will determine 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 programmatic BO. We consider this site-specific project analysis to be "Tier 2" of the consultation process, with the programmatic consultation (and resulting BO) constituting the "Tier 1" consultation. Our project-specific (Tier 2) consultations will focus on: 1) compliance with the reasonable and prudent measures and associated terms and conditions in the programmatic BO; 2) consistency with the scope and effects previously analyzed and disclosed in the programmatic BO and associated Biological Assessment; 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 of a "may affect" but "not likely to adversely affect" determination for a specific project that is consistent with the programmatic BO, no further evaluation by the Service is necessary and section 7(a)(2) consultation will be considered complete for that project (e.g., via a concurrence letter documenting the conclusion of informal consultation).

Species Not Likely To Be Adversely Affected

We have reviewed the information contained in the Revised Biological Evaluation, which describes the potential effects of the proposed project on federally listed species. As detailed below, we concur with your no effect/not likely to adversely affect determinations for these species.

The following federally listed species are known to occur within the MNF, however the project area is not expected to provide habitat for these species, and there are no known occurrences of these species within or near the project area. Therefore, the proposed project should have no effect on or is not likely to adversely effect the:

- Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*)
- Cheat Mountain Salamander (*Plethodon nettingi nettingi*)
- Bald Eagle (*Haliaeetus leucocephalus*)
- Shale Barren Rock Cress (*Arabis serotina*)
- Running Buffalo Clover (*Trifolium stoloniferum*)

West Virginia Northern Flying Squirrel (*Glaucomys sabrinus fuscus*)

Activities within the project area are located within forest compartments 69 and 70. The conifer component of compartment 69 is about 0.7% and 1.4% for compartment 70. Project area maps were compared to available maps and models of potential suitable West Virginia northern flying squirrel (WVNFS) habitat, including the current forest-wide map, and the results of the habitat modeling conducted by Menzel (2003). Only a small portion of the project area, located within stands 3 and 5 of compartment 70, fell within areas that could potentially provide suitable squirrel habitat. A 19 acre clearcut, a 5 acre wildlife savannah, and 2 acres of spruce plantings are the only activities planned for these stands under the preferred alternative. A review of stand data, field visits, and aerial photography showed no spruce present in either the under or overstory, and only small, scattered, and isolated patches of hemlock within the project area. Therefore, the Service concurs that no suitable habitat for the WVNFS occurs within the proposed project area, and determines that the project is not likely to adversely affect the WVNFS. Spruce plantings are proposed to occur in stand 3 within an area listed as having moderate potential (50-75%) for squirrel habitat under Menzel's model. These areas are generally likely to support spruce restoration, therefore the proposed plantings may have a mild beneficial effect on WVNFS habitat.

Small-whorled Pogonia (*Isotria medeoloides*)

The small-whorled pogonia is known to occur in Greenbrier County in dry, deciduous woods with acidic soils. Botanical surveys for this species were conducted in all proposed cutting units by MNF personnel in August 2001. The results of those surveys are summarized in a report completed for this project titled Desert Branch Botany Survey Results completed August 23, 2001. No small whorled pogonia were found during those surveys, consequently the Service concurs that the project is not likely to adversely affect this species.

Virginia Spirea (*Spiraea virginiana*)

Virginia spiraea generally grows along rocky, flood scoured banks of high energy streams and rivers, however it has also been documented along roadsides adjacent to wetlands and other flood prone areas. Potential habitat for Virginia spiraea could occur along the North Fork of the Cherry River. Potential impacts to this area, and therefore the species will be avoided through implementation of the MNF's riparian guidelines and by eliminating any clearing within 200 feet of the North Fork of the Cherry River, as described in the project Environmental Assessment. If these avoidance measures are implemented, the Service concurs that the proposed project is not likely to adversely affect Virginia spiraea.

Species Likely To Be Adversely Affected

As described in the Service's programmatic BO, we believe that adverse effects are likely to occur to the Indiana bat (*Myotis sodalis*) from harvesting or tree removal under the Forest Service's management program activities. Therefore, given the nature of activities associated with the proposed project, we concur with your determination that incidental take of Indiana bats is possible within the analysis area. However, based on the implementation of reasonable and prudent measures and associated terms and conditions from the programmatic BO, and the proposed site-specific conservation measures that will minimize the impact of any incidental take, we have concluded that activities associated with the project will not result in adverse effects to the Indiana bat beyond those that were previously disclosed and discussed in the Service's programmatic BO. This Tier 2 BO identifies the incidental take anticipated due to implementation of the Desert Branch project (preferred alternative), and the cumulative total of incidental take which has occurred (Table 1).

Description of the Proposed Action

The 3,013-acre Desert Branch Opportunity Area is located in Nicholas and Greenbrier Counties just east of Richwood, West Virginia. The boundaries of the action area include WV Route 39/55 and North Fork of Cherry River on the north, the Richwood corporate boundary on the west, and the National Forest boundary on the south. To the east, the boundary is formed by another 6.1 management area on the Gauley Ranger District, the Rabbit Run Opportunity Area. Of the total acres, 5 acres are on private land, located close to the mouth of Joe's Branch, between the highway and the river.

The activities in the Modified Proposed Action (Alternative 6) identified in the Environmental Assessment include the following: 19 acres in one clear cut; 14 acres in a two aged cut; 45 acres in 3 shelter wood cuts; 902 acres of thinning by conventional and helicopter methods; 12 acres of wildlife openings; 23 acres of wildlife savannahs; 2 acres of spruce planting; 2 acres aspen plantings; 2 acres of chestnut release; 1.3 (2.5 acres) miles of road construction; 0.5 mile of temporary road construction; 0.1 mile of trail relocation, and construction of 5 waterholes, a vista and a boardwalk. The Modified Proposed Action is a set of activities developed with the purpose of moving the Desert Branch area towards the desired future conditions identified for

Management Prescription 6.1 areas. The Forest Plan states that 6.1 areas should be managed for remote habitat for wildlife species intolerant of disturbance while also producing a mix of forest products and providing semiprimitive/nonmotorized recreation.

Status of the Species

The Indiana bat is a migratory species ranging throughout much of the eastern half of the U.S. The Indiana bat was listed as endangered by the Service pursuant to the Endangered Species Preservation Act on March 11, 1967 (32 Federal Register 4001). Listing was warranted based primarily on large-scale habitat loss and degradation, especially at winter hibernation sites, and significant population declines that continue today. From the time that the species was listed, the range-wide population of the Indiana bat has declined from approximately 883,300 Indiana bats for 1960/1970 to 387,301 in 2003/2004, or approximately 56 percent (Clawson 2002; Lori Pruitt, personal communication, 2004). It is currently estimated that West Virginia supports a hibernating population of approximately 10,770 Indiana bats (WVDNR, 2004).

Due to the colonial nature of Indiana bats, conducting censuses of hibernating bats is the most reliable method of tracking population/distribution trends range-wide, and provides a good representation of the overall population status and distribution. However, the relationship between wintering populations and summering populations is not clearly understood. It is known that individuals of a particular maternity colony come from one to many different hibernacula, therefore the summer location of most, if any, individuals of any particular hibernacula is often not known. Indiana bats have been documented to travel up to 300 miles from their hibernaculum to their maternity areas (Gardner and Cook 2002). Therefore, bats wintering or summering in West Virginia may come from a number of surrounding states, and the status of Indiana bats within each state's hibernacula may not reflect the status of that state's maternity population.

Additional information on the status of the species, including life history characteristics is provided in the programmatic BO, and is incorporated here by reference.

Reasons for Decline and Continued Threats

Because disturbance to hibernacula is a major threat to the Indiana bat, protection of hibernacula is a management priority. While many hibernacula have been protected, disturbance to hibernacula continues. For example, the largest hibernacula in Indiana (50,941 Indiana bats in 2003) is not gated, and based on data from electronic monitors in the cave, unauthorized visits to this cave occur during critical life stage periods. Also, at the only large hibernacula in Ohio (9,436 Indiana bats in 2004), there are still tours, as well as other commercial activities, taking place in the cave during the hibernation period.

Land use practices have also been identified as a suspected cause in the decline of the Indiana bat, particularly because habitat in the bats' maternity range has changed dramatically from pre-settlement conditions. Indiana bats exhibit site fidelity to their traditional summer maternity and foraging areas, and are known to return to the same general area to establish maternity colonies

from year-to-year (Humphrey et al. 1977; Gardner et al. 1991a, b; Callahan et al. 1997; Indianapolis Airport Authority 2003, 2004; Kurta and Murray 2002; Butchkoski and Hassinger 2002; Gardner et al. 1991a, Gardner et al. 1996). Roosting/foraging area fidelity may serve to increase the probability of successful reproduction, and to maintain social interactions between members of the population. Bats using familiar foraging and roosting areas may have decreased susceptibility to predators, increased foraging efficiency, and an improved ability to switch roosts if impacts occur to the original roost (Gumbert et al. 2002). In turn, site fidelity may also inhibit the ability of Indiana bats to pioneer new areas (Sparks *in Service* 2004c). Due to the ephemeral nature of roosting sites, bats are probably not dependant on the continued suitability of an individual tree. However, landscape level alterations in traditional maternity habitats may adversely affect Indiana bat survival and reproductive success. Notably, a formal consultation with the Corps of Engineers was recently completed (Service 2005) that may result in take of a maternity colony Boone County, WV as a result of harm through summer habitat loss.

In addition to an increased focus on Indiana bat summer habitat, attention has also been directed to investigate pesticide exposure (Clark et al. 1987; Clawson 1987; Garner and Gardner 1992; Callahan et al. 1997; 3D/E 1995; O'Shea and Clark 2002; Kurta and Murray 2002). Insecticides have been known or suspected as the cause of a number of bat dieoffs in North America, including endangered gray bats in Missouri (Mohr 1972; Reidinger 1972; Clark and Prouty 1976; Clark et al. 1978). The insect diet and longevity of bats also exposes them to environmentally persistent organochlorine chemicals that may bioaccumulate in body tissue and cause sub-lethal effects such as impaired reproduction (O'Shea and Clark 2002).

Environmental Baseline

The environmental baseline for the MNF was established and described on pages 15 -16 in the programmatic BO. The baseline condition in regard to winter hibernacula in the action area remains largely unchanged. However, since issuance of the programmatic BO, the environmental baseline in regard to the summer presence of Indiana bats in West Virginia and the MNF has changed appreciably. At the time the programmatic BO was written, there were no documented cases of Indiana bat maternity activity in the state of WV. However, in the summer of 2003, two post-lactating female Indiana bats were captured at a location in Boone County, WV. These captures represented the first documented case of Indiana bat maternity activity in WV. Maternity activity at this site was again confirmed when additional surveys were conducted in the summer of 2004. In the summer of 2004, a second maternity colony of approximately 25 bats was confirmed through the capture and tracking of a lactating female Indiana bat. This colony was located adjacent to the MNF in Tucker County and is located within 2-miles of a known Indiana bat hibernacula. That same summer, three male Indiana bats were captured on another site on the MNF in Pendleton County. These bats were tracked to a roost tree and subsequent emergence counts on that tree revealed 23 bats. Although, maternity activity (through the presence of female Indiana bats) was not confirmed at this site, data suggest that this site may also support a maternity colony.

In addition to these captures near potential or confirmed maternity colonies, individual male Indiana bats have been captured at a number of locations throughout the state in the following

counties: Clay-1 (1999); Nicholas-1 (1999) Fayette/Nicholas County line -1 (2004); Randolph-3 (1999, 2000 and 2002 with a recapture in 2003); Pocahontas -1 (2004); and Raleigh-1 (2003).

These captures of both male and female bats confirm that the Indiana bat uses forested habitats throughout the state, including habitats within the MNF, for summer foraging and roosting. The increase in recent captures may not reflect an actual increase in densities of Indiana bats summering within the state or the MNF, rather these results may reflect the fact that survey efforts in relation to project review and monitoring have increased in recent years. As a result of coordination between the Service and the MNF, and in accordance with terms and conditions of the programmatic BO, the MNF has adapted Indiana bat monitoring efforts to focus on detecting the presence of the bat in likely habitat, rather than surveying locations prior to project clearance. These changes may have resulted in the increased detection of the bat on the MNF, and should allow for improved protection for the species and more accurate tracking and evaluation of potential take as a result of MNF projects.

Status of the Species Within the Action Area

On August 5, 1999 the MNF discovered a juvenile male Indiana bat while examining bridges near the project area. The capture occurred on the Gauley Ranger District approximately 2.5 miles north northeast of Richwood, WV. The capture site was located where Highway 39/55 crosses the North Fork of the Cherry River. While, the Indiana Bat Recovery Plan states that one bat capture does not necessarily represent a maternity colony; the capture indicated that potential for one in this area existed. To help further evaluate the significance of this one capture, the MNF, USFWS, and West Virginia Division of Natural Resources (WVDNR) agreed that a temporary 3-year, 2-mile radius buffer would be established around the discovery site, and that additional surveys would be conducted to evaluate the potential that a maternity colony was present in the area. This approach is consistent with the terms and conditions outlined in the programmatic BO.

Follow-up mist net and bridge surveys in the vicinity of the project/previous capture site were completed in 2000, 2002, 2003, and 2004. Surveys were conducted using the methods outlined in the Service's Indiana bat mist net guidelines. Site selection targeted flight corridors and water sources (ponds, road ruts, streams, and rivers) and was coordinated with USFWS and WVDNR. A total of 14 survey sites were established within 5 km of the juvenile Indiana bat capture, and more than 35 additional mist netting sites were established within the general area of the juvenile Indiana bat capture.

As a result of these surveys, over 350 bats were captured within 5 km of the juvenile Indiana bat capture, and more than 700 bats were captured in the surrounding area. Despite considerable efforts, these surveys did not capture or otherwise identify additional Indiana bats, and no additional evidence of a maternity site existing in the area was detected. Lacking additional captures of Indiana bats from the Desert Branch sites, using established methods, it is both reasonable and logical to conclude that no maternity site is located in the immediate area of the 1999 capture. Rather, it is quite possible that this juvenile male bat was migrating from a maternity site outside the project area to a hibernaculum on or near the Forest (Stihler and Tolin,

personal communication, 2005). The capture was close to the approximate time of the year when swarming normally begins (mid August). During years with climatic conditions similar to those experienced in 1999 (exceptionally warm and dry) Indiana bats give birth early and the young develop more quickly. Therefore, the young become volant and are ready to journey to the swarming area earlier in the year. Research also suggests that males typically arrive early at hibernacula (Stihler, pers. comm. 1999). Given this preponderance of evidence (date of capture, climatic conditions, roost location, single capture, and lack of additional captures after multiple years of surveys), the MNF and the Service concur that the juvenile male was likely a transient or migratory individual that enroute to its fall hibernacula.

Factors Affecting the Environment of the Species (on the MNF and in the Action Area)

Effects from past management (turn of the century clear-cutting, clear-cuts, thinning, wildlife opening, and roads) have produced the current condition, which provides considerable potential roosting habitat for the Indiana bat. At present, 7.6% (230 acres) of the 3,013 acre project area is non-forested and the remaining 92% (2,783 acres) of the area is forested. Most of this forested area (62%) is mixed hardwoods. Within the existing non-forested lands, other projects have produced upland water sources, such as wildlife ponds that benefit bats, and openings that are producing small amounts of edge exposed to solar radiation, which could benefit maternity roosts. These habitat types constitute 1.7% of project area. The adjacent landowner to the South, a timber harvest company, is managing their land similar to that of the MNF, with slightly more emphasis on regeneration cutting (about 10% per entry as compared to the 8% allowed in the Forest Plan) and road building. Other private land near Desert Branch is not providing much in the way of roosting habitat, as it is mostly residential home sites or within the town of Richwood, WV.

Effects of the Action

Project effects will result in a total of 112 acres of new open areas being created. An additional 902 acres of forested habitat would be subject to thinning, although these areas would still remain as largely forested habitat. When project impacts are considered in conjunction with baseline conditions, a total of approximately 11% of the project area would consist of non-forest or openings, and the remaining project area would consist of forested habitat with a mixed composition of age classes. The implementation of the terms and conditions of the programmatic BO, and project-specific and forest wide conservation/mitigation measures would ensure that this area would remain suitable to support Indiana bats in the future by: 1) keeping riparian corridors intact; 2) providing adequate Indiana bat roosting habitat; and 3) retaining or creating water sources, foraging habitat, and travel corridors within the action area. If future monitoring conducted on the MNF identifies additional evidence of Indiana bats utilizing the project areas, the MNF would consult with the Service and the WVDNR to develop further protective measures in accordance with the MNF Forest Plan and the programmatic BO.

The direct effects of these action alternatives are that tree removal during the non-hibernation period (April 1 - November 14) may result in mortality (take) of an individual roosting Indiana bat, if a tree that contains a roosting bat is removed intentionally or felled accidentally. If a bat using a roost tree that is removed is not killed during the removal, the roosting bat would be

forced to find an alternative tree, potentially expending a significant amount of energy that would result in harm or harassment of the individual. This also constitutes take. However, all proposed activities fall within the scale and the scope addressed in the programmatic BO and within the level of take identified in the Incidental Take Statement.

The closest known Indiana bat hibernaculum is over 18 miles from the project area, therefore no Indiana bat swarming or hibernation habitat would be affected by this project.

Cumulative Effects

Future Federal, State, local and private actions that are reasonably certain to occur within the Action area, will most likely either be carried out by, or will require a permit from, the Forest Service. These actions will therefore require a section 7 consultation. The Service is not aware of any future State, local, or private actions that could occur within the action area that would not be subject to a section 7 review. Therefore, cumulative effects, as defined in the ESA, are not expected to occur within the action area.

Conclusion

The actions and effects associated with the proposed Desert Branch project are consistent with those identified and discussed in the Service's 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 for the project area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Indiana bat.

For this project, the documentation of an Indiana bat in the project area has not resulted in a jeopardy determination or the area being deemed within the Zone of Immediate Concern for a maternity colony because: 1) only one bat has been documented using the project area; 2) the bat was a transient male and was not associated with a maternity roost; 3) additional mist net surveys over the course of at least three years failed to document any Indiana bats; and 4) implementation of the terms and conditions associated with the reasonable and prudent measures in the programmatic BO, along with the project-specific conservation/mitigation measures proposed by the MNF, will minimize any incidental take.

Incidental Take Statement

The Service anticipates that the proposed actions associated with the Desert Branch Project will result in the incidental take of Indiana bat habitat (acres) as outlined in Table 1. The type and amount of anticipated incidental take is consistent with that described in the programmatic BO and does not cause the total annual level of incidental take (forested acres) in the programmatic BO to be exceeded. The actual incidental take reported by the Forest Service has consistently been below the annual levels estimated (authorized) in the programmatic BO, therefore, we do not anticipate that implementation of this project will result in the take levels in the programmatic BO to be exceeded.

Table 1: Actual vs. authorized incidental take (as measured indirectly by acreage) due to the removal or disturbance of potential Indiana bat habitat on the Monongahela National Forest

Activity	Desert Branch Project	Previous Projects (2005)	Total	Annual Incidental Take Authorized
Timber Harvest	1,015	389	1,404	6,000
Road Construction	~ 3	0	3	47
Mineral Development	0	0	0	78
Prescribed Burn	0	0	0	300

Reasonable and Prudent Measures

The Forest Service must implement all pertinent reasonable and prudent measures and terms and conditions stipulated in the programmatic BO to minimize the impact of the anticipated incidental take of Indiana bats, and to be exempt from the take prohibitions of section 9 of the ESA. We have determined that no new reasonable and prudent measures, beyond those specified in the programmatic BO and the project specific mitigation measures as described in the July 2004 Environmental Assessment, are needed to minimize the impact of incidental take anticipated for the Desert Branch Project as described in the Revised Biological Evaluation.

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 programmatic BO. If implementation of any project or projects is anticipated to exceed these take levels, further consultation will be necessary. To ensure that incidental take is not exceeded, quarterly reports should be provided to this office tabulating the amount of incidental take on projects being implemented and authorized throughout the MNF, as indirectly measured by acres affected.

This fulfills your consultation requirements for this action. 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 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 take as identified in Table 1 is exceeded, reinitiation of formal consultation as outlined in 50 CFR 402.16 is required.

Mr. Clyde N. Thompson
March 15, 2005

10

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,

Thomas R. Chapman
Field Supervisor

Mr. Clyde N. Thompson
March 15, 2005

11

cc:

WVDNR – Taylor/Stihler

Project File

Reader File

ES:WVFO:BDouglas:skd:3/15/2005

Filename: U:\Finalized Correspondence\US Forest Service\2005\March\1994_Desert-Branch-
Project.doc

Literature Cited

- Butchkoski, C. M. and J.D. Hassinger. 2002. Ecology of a maternity colony roosting in a building. *In* Kurta A., and J. Kennedy, eds. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, Texas.
- Clark, R.D., Jr., and R.M. Prouty. 1976. Organochloride residues in three bat species from four localities in Maryland and West Virginia, 1973. *Pesticide Monitoring Journal*. 10: 44-53.
- Clark, D.R., R.K. La Val, and D.M. Swineford. 1978. Dieldren-induced mortality in an endangered species, the gray bat (*Myotis grisescens*). *Science* 199: 1357-1359.
- Callahan. E.V., R.D. Drobney, and R.L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. *Journal of Mammalogy*. 78: 818-825.
- Clark, B.K., J.B. Bowles, and B.S. Clark. 1987. Summer status of the endangered Indiana bat in Iowa. *American Midland Naturalist*. 118: 32-39.
- Clawson, R.L. 1987. Indiana Bats: Down for the Count. *Endangered Species Technical Bulletin*. Vol. XII No. 9.
- Clawson, R.L. 2002. Trends in population size and current status. *In* Kurta A., and J. Kennedy, eds. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, Texas.
- Humphrey, S.R., A.R. Richter and J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. *Journal of Mammalogy*. 58: 334-346.
- Indianapolis Airport Authority. 2003. Habitat conservation plan report for monitoring year 2002.
- Indianapolis Airport Authority. 2004. Habitat conservation plan report for monitoring year 2003.
- Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991a. Summary of *Myotis sodalis* summer habitat studies in Illinois: with recommendations for impact assessment. Unpublished report prepared for Indiana/Gray bat Recovery Team Meeting, Columbia, Missouri, March 1991. 28p.
- Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991b. Summer roost selection and roosting behavior of *Myotis sodalis* (Indiana bat) in Illinois. Unpublished report prepared for U.S. Department of Interior, Fish and Wildlife Service, Region 3, Twin Cities, Minnesota. 56p.
- Garner, J.D., and J.E Gardner. 1992. Determination of summer distribution and habitat utilization of the Indiana bat (*Myotis sodalis*) in Illinois. Unpublished report prepared for Illinois Department of Conservation, Division of Natural Heritage, and Illinois Natural History Survey, Center for Biogeographic Information. 23p.

Gardner, J.E., J.E. Hofmann, and J.D. Garner. 1996. Summer distribution of the federally endangered Indiana bat (*Myotis sodalis*) in Illinois. Transactions of the Illinois State Academy of Science. 89: 187-196.

Gumbert, M.W., J.M. O'Keefe, and J.R. MacGregor. 2002. Roost fidelity in Kentucky. Pages 143-152 *In* Kurta A., and J. Kennedy, eds. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, Texas. 253p

Kurta, A. and S.W. Murray. 2002. Philopatry and migration of banded Indiana bats (*Myotis sodalis*) and effects of radio transmitters. Journal of Mammalogy. 83: 585-589.

Menzel, J.M. 2003. An examination of the habitat requirements of the endangered Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) by assessing nesting sites, habitat use and the development of a habitat model. West Virginia University, PhD dissertation.

Mohr, C. E. 1972. The status of threatened species of cave-dwelling bats. Bull. Nat. Speleol. Soc. 34: 33-47.

O'Shea, T.J., and D.R. Clark, Jr. 2002. An overview of contaminants in bats, with special reference to insecticides and the Indiana bat. *In* Kurta A., and J. Kennedy, eds. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, Texas.

Pruitt, L. March 2004. Personal communication. Biologist. U.S. Fish and Wildlife Service, Bloomington, Indiana Ecological Services Field Office. Bloomington, IN.

Reidinger, R.F. 1972. Factors influencing Arizona bat population levels. Tempe, AZ: University of Arizona. 172 p. Ph.D. dissertation.

Stihler, C. 1999/2004. Personal communication. Biologist. West Virginia Division of Natural Resources, Elkins, WV.

Tolin, W. 2004. Personal communication. (Retired) Biologist. U.S. Fish and Wildlife Service, West Virginia Field Office, Elkins, WV.

3D/International, Environmental Group. 1995. Literature summary and habitat suitability index model: components of summer habitat for the Indiana bat, *Myotis sodalis*. Unpublished report submitted to Indiana Department of Natural Resources, Division of Natural Resources, Bloomington, Indiana. 190p.

USDA Forest Service. 2004. Status Report: Monongahela National Forest, 1999 Juvenile Male Indiana Bat Capture in Gauley Ranger District, Nicholas and Greenbrier Counties, West Virginia

U.S. Fish and Wildlife Service. 1999. Agency draft Indiana Bat (*Myotis sodalis*) revised recovery plan. 53pp.

U.S. Fish and Wildlife Service 2002. Biological Opinion and Take Statement for the Monongahela National Forest. Signed by Jeffrey Towner, Field Supervisor, Elkins, WV

U.S. Department of Interior, Fish and Wildlife Service. 2004c. Notes from Indiana bat meeting held at National Conservation Training Center. 20-23 July 2004.

U.S. Department of the Interior, Fish and Wildlife Service. 2005. Biological Opinion on the Impacts of the Laxare East & Black Castle Contour Coal Mining Projects on the Indiana Bat; February, 2005. Regional Office – Region 5, Hadley, Massachusetts; West Virginia Field Office, Elkins, West Virginia.

West Virginia Division of Natural Resources. 2004. Endangered Species Federal Assistance Performance Report, Project E-1. WV Div. Nat. Resources.