2003 Aerial Survey of Virginia's Mountains for Nesting Peregrine Falcons

May 2003

Virginia Department of Game and Inland Fisheries
Bureau of Wildlife Resources
Wildlife Diversity Division
Nongame and Endangered Wildlife Program
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Executive Summary

It has been approximately ten years since an aerial survey for nesting peregrine falcons has been conducted in Virginia. With the hacking of over 100 peregrines in the Virginia Mountains in the late 1980s through the 1990s and the reported nesting success of peregrines in adjacent states, a survey of the historic eyries and cliffs with high potential for supporting nesting peregrines was warranted.

Between 3 April and 10 June 2003, a total of 23 sites was surveyed for nesting peregrine falcons. Both fixed-wing and helicopter surveys were conducted to collect data on presence and/or absence of raptors, condition of cliff, availability of nesting ledges, cliff aspect, and potential for ground access. Sites surveyed included historic eyries, historic hack sites, and potential sites identified from previous aerial surveys.

While no peregrine falcon eyries were identified, three sites contained ledges with prominent whitewash. In additional, several other sites were identified as priority areas for additional aerial and ground surveillance. Photographs for most sites are presented representing the current condition of cliff faces. Specific recommendations are made for each site surveyed as well as focal areas that should receive additional survey efforts.

ACKNOWLEDGMENTS

I'd like to thank Denny Martin and Charles Randow for their role in the initial fixed-wing surveys and the Wildlife Division of the Virginia Department of Game and Inland Fisheries (VDGIF) for providing Denny and the aircraft. John Reid for his skillful piloting of the helicopter and keeping us safe. Jeff Cooper, Mike Fies, and John Baker of the VDGIF and Rolf Guebler of the Shenandoah National Park for their assistance with the helicopter flights. Alan Boynton (VDGIF) was extremely helpful in reviewing and critiquing the photographs. Mike Wilson, Ruth Boettcher, Jeff Cooper, and Ray Fernald of the VDGIF for their reviews. Lastly, I'd like to thank the U.S. Fish and Wildlife Service, Pittman Robertson WE-99 agreement for providing the funding for this project.

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Introduction

Although never considered common, the peregrine falcon (*Falco peregrinus*) nested throughout the mountains of Virginia. Johannes Gabler (1983) identified 24 historic eyries in Virginia that were known to birders and falconers. Because of the remoteness of several cliff sites in southwest Virginia, the actual number of eyries in Virginia may have been greater. As was the trend with peregrines in the East, the peregrine falcon in Virginia became extinct by the mid 1960's (Hickey 1969). The extirpation of the peregrine in the East is predominately attributed to the widespread use of organochlorine pesticides such as DDT.

With the loss of the peregrine falcon in the East, the U.S. Fish and Wildlife Service listed the species as endangered in 1970. One of the tasks to help recover the species included a captive breading program designed to raise birds for release. The reintroduction program in the East started in 1973 and Virginia released its first birds in 1978. By 1993, Virginia had reintroduced 115 peregrines along the coast (Byrd 1983, 1990) and 131 peregrines in the mountains (Byrd et al. 1993). Significant hacking efforts curtailed at this point with a few additional peregrines being released as resources and funding became available.

In the early 1990's survey efforts were undertaken to identify peregrine nesting sites in the mountains of Virginia. In 1992 the first wild peregrines in the mountains were identified at Little Stony Man Mountain in Shenandoah National Park (Byrd et al. 1992). The first successful nesting attempt was recorded in 1994 when two chicks fledged from Stony Man Mountain (Byrd et al. 1994). However, efforts to identify nesting peregrines at other mountain localities failed. By the late 1990's survey efforts were halted due to lack of volunteers and limited funding.

In 2003, funds were secured to conduct an aerial survey of the historic eyries, hacking sites, and high priority cliffs in the mountains of Virginia. This report details the efforts and results of the 2003 mountain survey for nesting peregrine falcons.

Methods

Fixed-wind and helicopter surveys were conducted to search for nesting peregrine falcons in the mountains of Virginia between 3 April and 10 June 2003. Fixed-wing flights were used to assess and prioritize sites for a secondary helicopter survey. Information was gathered on presence/absence of raptors, condition of cliff, availability of nesting ledges, cliff aspect, and potential for ground access. Sites were chosen based on historical evidence of peregrines nesting at the site, previous aerial surveys, and known historic hack sites (Table 1). Several sites on the Shenandoah National Park were not visited due to existing hacking and monitoring efforts that were currently underway. Below are the sites and observations for all 23 cliffs surveyed. Acronyms in column "Type" are coded as follows: A, B = High potential nesting sites identified by Baker, Byrd, and Thomas (J. Baker to R. Reynolds and M. Byrd 1992); SNP = Shenandoah National Park; H = Historic eyrie; and X = Hack site. Sites are presented on a North to

South continuum based on UTM coordinates and county. Figure 1 shows the relative location of sites by county.

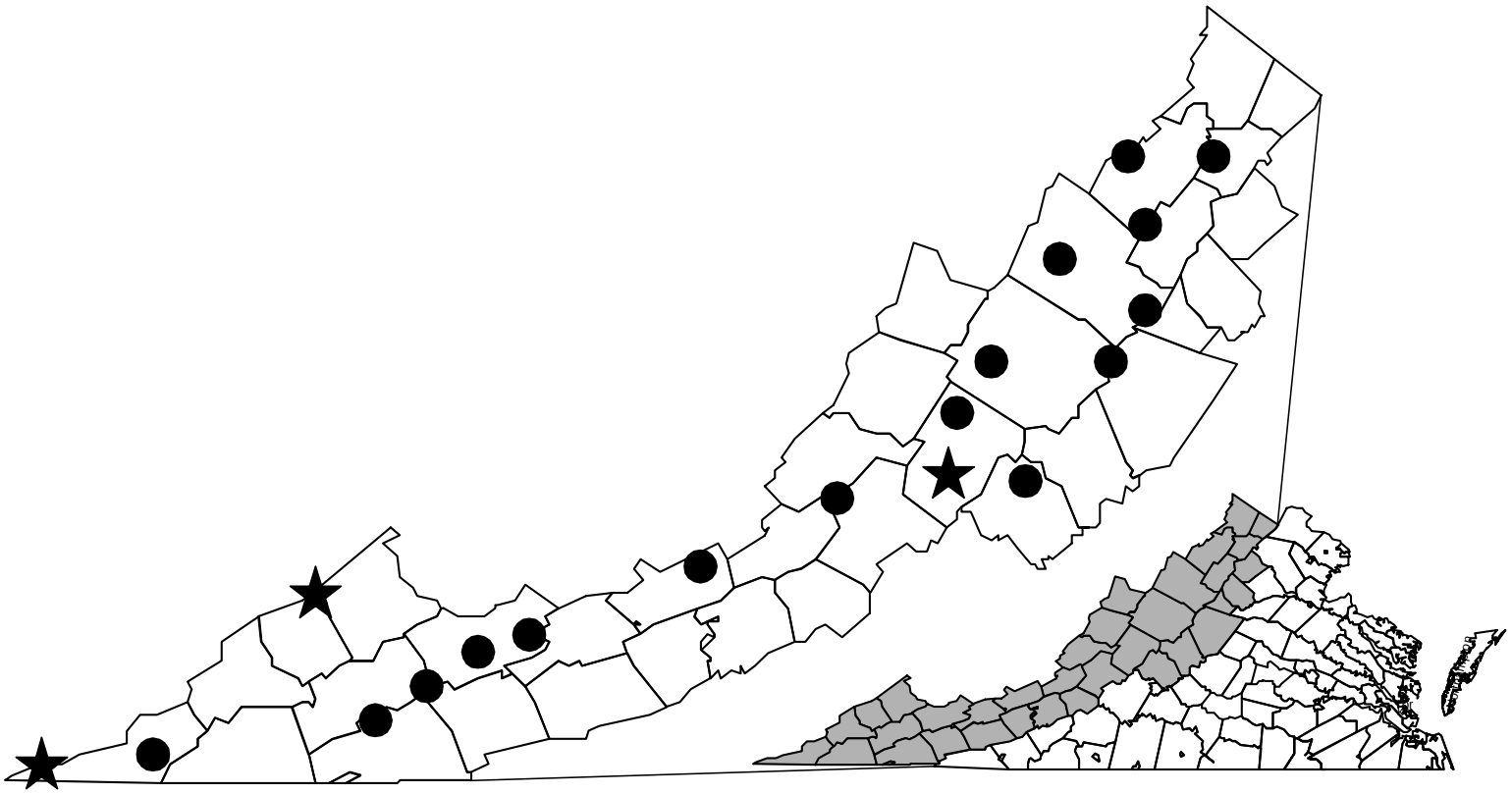


Figure 1. Survey sites for nesting peregrine falcons (*Falco peregrinus*). Stars indicate sites with ledges containing significant whitewash. Some points may contain more than one survey site.

Table 1. Site name, type (acronyms described in the Methods section), and location information for the cliffs surveyed during the 2003 peregrine falcon mountain survey. X and Y coordinates are in projection UTM Zone 17, datum NAD83.

Site Name	County	Type	Quad	X-coordinate	Y-coordinate
Fort Valley	Warren	H	Strasburg	733343.18695	4311824.19933
New Market	Page	H	Hamburg	708009.78162	4279938.81700
Rocky Mount	Rockingham	SNP	McGaheysville	705862.29500	4245207.56005
Rocky Mountain	Rockingham	SNP	McGaheysville	703587.54812	4241130.98732
Big Schloss	Shenandoah	X	Wolf Gap	702341.29301	4312526.77921
Brown Mountain	Rockingham	SNP	McGaheysville	701431.62409	4241568.36509
Rip Rap	Augusta	H	Crimora	693375.82160	4226719.98462
Riven Rock Ridge	Rockingham	H	Rawley Springs	669396.06644	4264494.91740
Cole Mountain	Amherst	X	Montebello	658617.41848	4179838.18477
Elliot Knob	Augusta	X	Elliot Knob	646990.42762	4224798.33829
Jump Mountain	Rockbridge	H	Goshen	638956.30906	4200245.07576
Big and Little House	Rockbridge	A	Buena Vista	627727.34115	4188196.24628
Nichol's Knob	Allegheny	H	Jordan Mines	586180.67966	4168911.65470
Barneys Wall	Giles	H	Eggleston	536422.79020	4135473.52134
Hutchinson Rock	Tazewell	B	Hutchinson Rock	464039.36644	4105660.55598
Dial Rock/Buck Mountain	Tazewell	A	Tiptop	461229.56837	4112004.18497
Morris Knob/Chimney Rock	Tazewell	A	Tazewell South	446420.02607	4101186.43283
Redrock Cliff	Smyth	A	Saltville	428509.74288	4086487.35268
House and Barn Mtn.	Russell	A	Middlesboro	421916.12599	4095056.65215
Brumley Mountain	Washington	B	Brumley	403721.04916	4075635.04805
Towers	Dickenson	H	Elkhorn City	385171.50136	4126430.26186
Powell River	Lee	A	Ben Hur	311456.62490	4059120.09642
White Rock #2[1]	Lee	A	Ewing	283791.38745	4060558.90563
White Rock Cliff	Lee	A	Varilla	273004.80264	4059535.24649

[1] Described in the Results and Discussion section under White Rock

Results and Discussion

Site	Flights	Type	County
Fort Valley	**Fixed-wing/Helicopter**	**H**	**Warren**

Fixed-wing: 24 April. North-NE exposure. This is an historic site comprised of a couple of rock outcrops. This site appears fairly fractured and over grown with vegetation. No "suitable" ledges were apparent. This site appears to be deteriorating and of poor quality for nesting peregrines. Ground survey would be difficult due to access. Turkey vultures were observed in the area.

Helicopter: 10 June. The helicopter survey confirmed the observations from the fixed-wing flights. The rocks appear to be highly fractured and sloughing and lack suitable nesting ledges. Vegetation is growing both on and in front of the rock outcrops obscuring the view. This site should be surveyed from the ground to assess potential for management alternatives.

Fort Valley (Warren County)

Site	Date	Type	County
Big Schloss	**Fixed-wing**	**X**	**Shenandoah**

Fixed-wing: 24 April. Multiple exposures. This is an old hack site on the George Washington and Jefferson National Forest. There are several rock outcrops in the area that appear suitable for nesting peregrines. There is a fair amount of hiking and backpacking traffic in the area with a trail near the main cliff. Site is relatively easily accessed by ground. No birds or whitewash was observed.

Photographs: No photographs were taken at this site.

Site	Flights	Type	County
New Market	**Helicopter**	**H**	**Page**

Helicopter: 10 June. South-SE exposure. This is an historic site with several rock outcrops at the top of Massanutten Mountain. There appear to be suitable ledges on all of the rock outcrops. However, the rock outcrops are fairly fractured and deteriorating. Vegetation is encroaching on some of the rock faces and several of the ledges appear to be easily accessible to predators. Ground surveys would be feasible for some of the outcrops and difficult for others. No raptors or whitewash was observed.

New Market (Page County)

Site	Flight(s)	Type	County
Riven Rock	**Fixed-wing/Helicopter**	**H**	**Rockingham**

Fixed-wing: 24 April. Northeast exposure. This is an historic site that is overgrown with vegetation and tall trees. This site is no longer accessible to peregrines. There is easy access off the local county roads. No raptors or whitewash was observed.

Helicopter: 10 June. Helicopter flight confirmed the site is overgrown with tall trees and vegetation growing on the rock faces. No raptors or whitewash was observed. Because this is an historic site, a ground survey should be conducted to determine potential for management actions and suitability as a potential eyrie.

Photographs: No photographs were taken of this site.

Site	Flight(s)	Type	County
Brown Mountain	**Helicopter**	**SNP**	**Rockingham**

Helicopter: 10 June. This is a small "knife edge" rock outcrop on the Shenandoah National Park. Vegetation is encroaching on the rock face and existing ledges do not look adequate for nesting. This site should be surveyed from the ground to confirm its status. Future aerial surveys should be coordinated with other efforts if time and resources allow.

Brown Mountain (Rockingham County)

Site	Flight(s)	Type	County
Rocky Mountain	**Helicopter**	**SNP**	**Rockingham**

Helicopter: 10 June. This site is comprised of several broken rock outcrops on the Shenandoah National Park. Vegetation is encroaching both in front of and on the rock faces. Existing ledges do not look adequate for nesting peregrines. In addition the rock outcrops are flaking and deteriorating. Most of the rock appears accessible to ground predators. This site should either be dropped from future aerial surveys or visited in conjunction with other work in the area.

Rocky Mountain (Rockingham County)

Site	Flight(s)	Type	County
Rocky Mount	**Helicopter**	**SNP**	**Rockingham**

Helicopter: 10 June. This is a small area with a couple of rock outcrops on the Shenandoah National Park. Vegetation is encroaching both in front and on the rock faces. There appear to be no adequate ledges to support nesting peregrine falcons. These rocks are easily accessible to ground predators. This site should be dropped from future surveys.

Rocky Mount (Rockingham County)

Site	Flight(s)	Type	County
Rip Rap	**Fixed-wing/Helicopter**	**H**	**Amherst**

Fixed-wing: 24 April. Multiple exposures. This is an historic site with a number of rock outcrops. However, most of the rock outcrops appear to be over grown with maturing vegetation adjacent to the rocks. In addition, vegetation is growing on the rock faces potentially inhibiting peregrine use. There is reasonable access off Skyline Drive. No raptors or whitewash was observed.

Helicopter: 10 June. Helicopter flight confirmed the site is overgrown with tall trees and vegetation growing on the rock faces. No raptors or whitewash was observed. This site should be surveyed from the ground to determine availability of suitable ledges and potential for management options.

Photographs: No photographs were taken of this site.

Site	Date	Type	County
Elliot Knob	**Fixed-wing**	**X**	**Augusta**

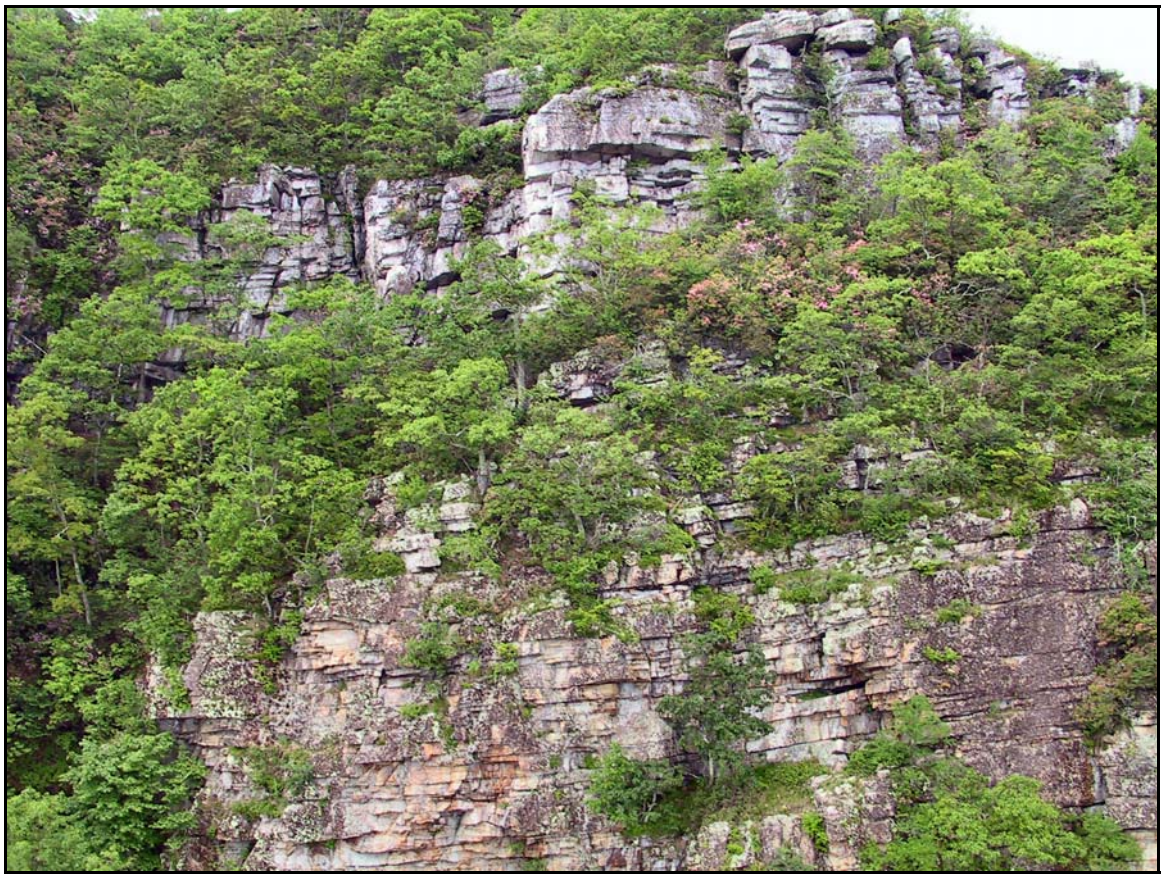
Fixed-wing: 24 April. This is an old hack site that has no significant rock outcrops. The hack site was an old Forest Service fire tower. While this combination worked for hacking young birds there is no habitat for adult birds to breed. This site should be dropped from future surveys.

Photographs: No photographs were taken at this site.

Site	Date	Type	County
Jump Mountain	**Fixed-wing/Helicopter**	**H**	**Rockbridge**

Fixed-wing: 24 April. Northeast exposure. This historic site consists of a couple of rock outcrops at the top of the mountain. There appear to be available ledges, but the rock appears highly fractured and vegetation is encroaching in many areas. Two turkey vultures soared close to the cliff. A trail provides good access to the cliff area.

Helicopter: 10 June. There appear to be several suitable ledges for nesting peregrines. Some of the overhangs lack a suitable ledge beneath them. One of the best looking ledges has vegetation growing adjacent to it. Like many of the sites, encroaching vegetation on the rock may be a limiting factor affecting site use. Several turkey vultures flew from the rocks on our approach. No whitewash was observed on any of the ledges.

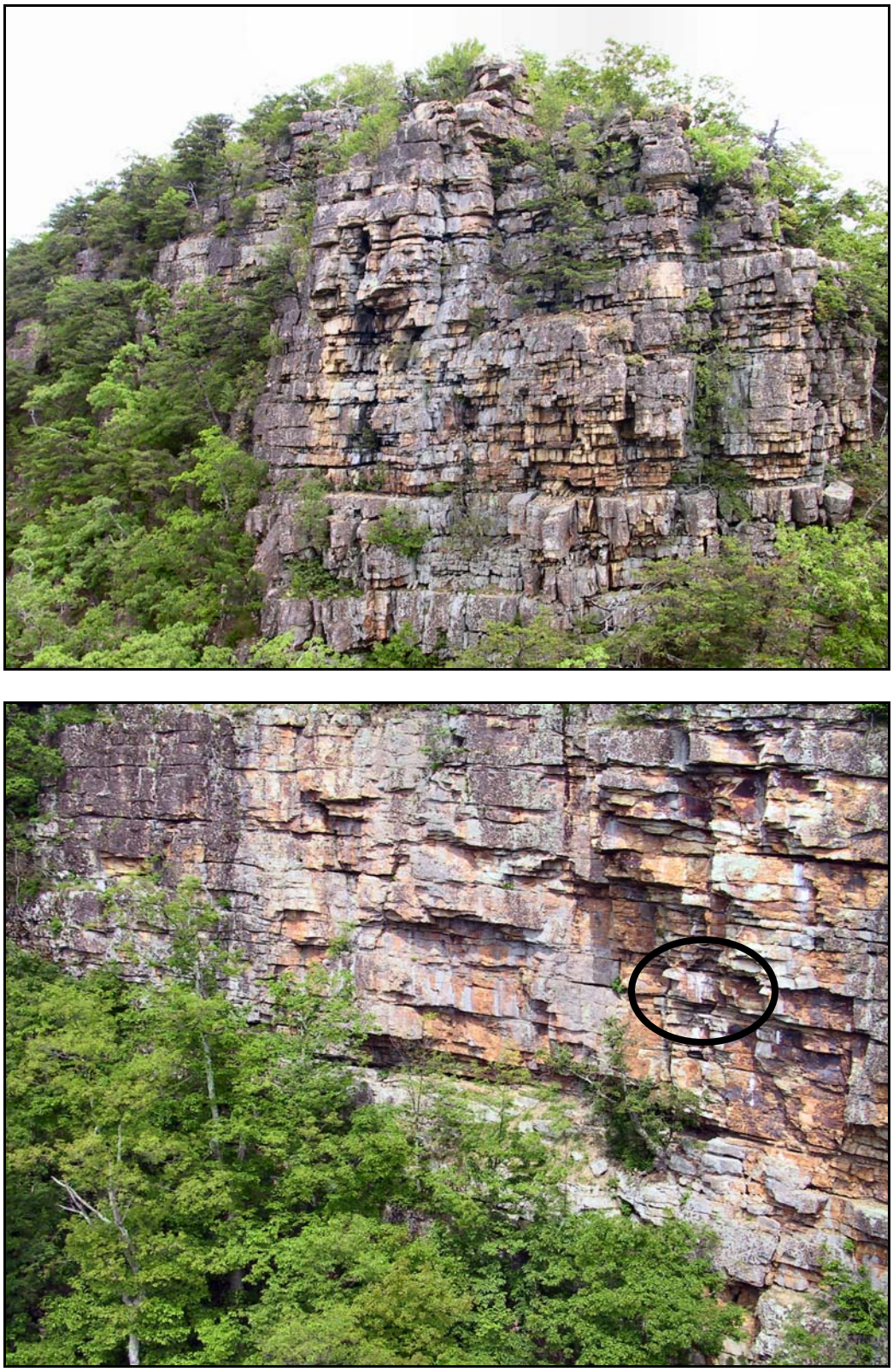


Jump Mountain (Rockbridge County)

Site	Flight(s)	Type	County
Big House/Little House	**Fixed-wing/Helicopter**	**A**	**Rockbridge**

Fixed-wing: 3 April. North-NE exposure. This is a good-looking site that is south of Jump Mountain (historic site) approximately 16 kilometers. The site consists of two large rock outcroppings on the north end of Big and Little Mountains. The two outcrops are approximately 1400 meters apart. Big House appears more suitable because of size, available ledges, and less vegetation on rock. No raptors or whitewash was observed at either site. Ground survey would be difficult due to lack of roads or trails accessing the site.

Helicopter: 10 June. Big House has a ledge on the lower 1/3 of the rock face with significant whitewash. No birds appeared on the ledge and no raptors were evident around the cliff face upon arrival. Little House had over 10 turkey vultures flying around the top of the rocks as we approached. The cliff face has some vegetation growing on it with few suitable nesting ledges.



Big House/Little House (Rockbridge County)
Oval identifies ledge with significant whitewash.

Site	Flight(s)	Type	County
Cole Mountain	**Fixed-wing**	**X**	**Amherst**

Fixed-wing: 24 April. This is an old hack site on the George Washington and Jefferson National Forest. There is little exposed rock and no "suitable" rock faces or ledges for nesting peregrines were observed. The site may have been chosen as a hack site because of easy access. This site should not be monitored in the future.

Photographs: No photographs were taken of this site.

Site	Flight(s)	Type	County
Nichol's Knob	**Fixed-wing/Helicopter**	**H**	**Allegheny**

Fixed-wing: 3 April. North-NE exposure. This is an historic site consisting of a main rock face with suitable nesting ledges. No raptors or whitewash was observed at the site. Ground survey is feasible with a trail that runs close by.

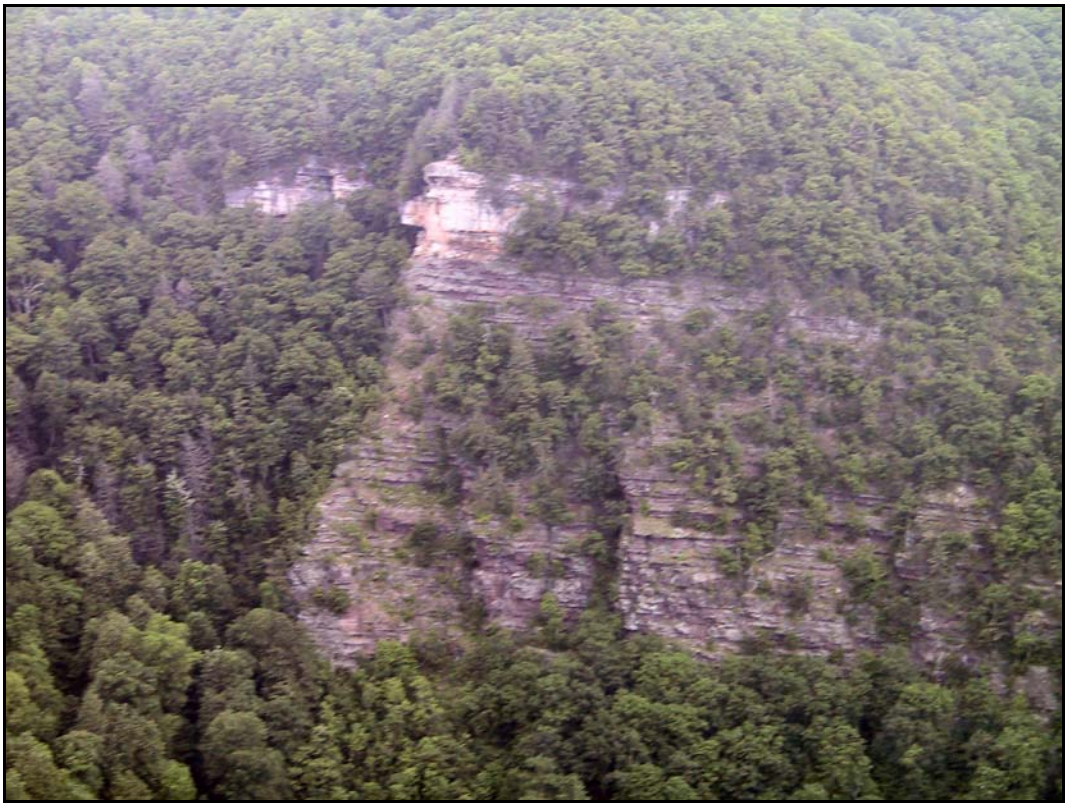
Helicopter: 10 June. There are a couple of good nesting ledges, but some appear accessible to ground predators. Encroachment of vegetation on the cliff face may be a problem in the future. No raptors or whitewash was observed.

Nichol’s Knob (Allegheny County)

Site	Flight(s)	Type	County
Barney's Wall	**Fixed-wing/Helicopter**	**H**	**Giles**

Fixed-wing: 3 April. East exposure. This is an historic site consisting of a main rock face that appears suitable for nesting. No raptors or whitewash was observed at the site. Ground survey is feasible; the hike would be fairly long. There may be a possibility of accessing the site from above along the "cell tower" road.

Helicopter: 6 June. No raptors or whitewash was observed. On close inspection of this site, the rock is highly fragmented and sloughing. Ledges did not look adequate for nesting. Additional ground survey should be conducted to evaluate the ledges and suitability for nesting peregrines.

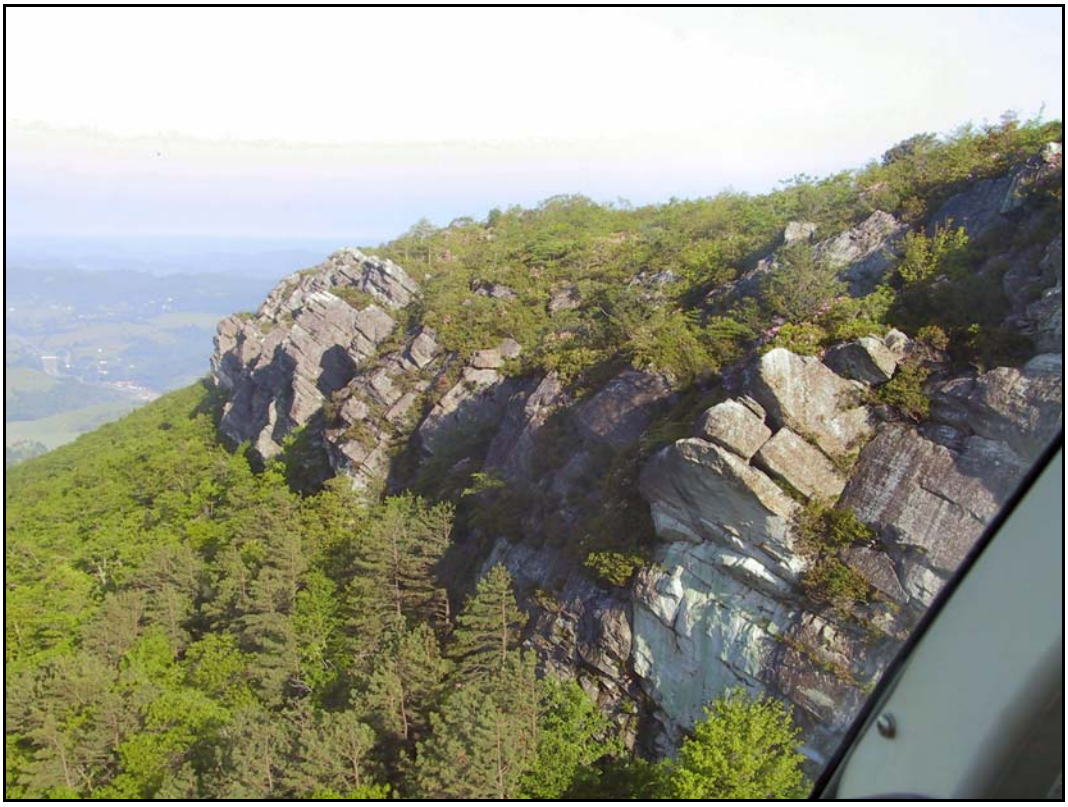


Barney’s Wall (Giles County)

Site	Flight(s)	Type	County
Dial Rock/Buck Mtn.	**Fixed-wing/Helicopter**	**A**	**Tazewell**

Fixed-wing: 3 April. South-SE exposure. This is a site with a long stretch of rock at the top of the mountain that appears suitable for nesting. The rock face is broken in places by vegetation. No raptors or whitewash was observed at the site. Access is possible off private land below the cliff area.

Helicopter: 6 June. While this site has a nice long stretch of exposed rock, the angle of the rock in several sections is such that adequate ledges are not formed. Other sections of the cliff face are solid and smooth, lacking adequate ledges. An artificial nesting structure or modification of an existing ledge could provide suitable nesting habitat. A black vulture was observed in the area.



Dial Rock/Buck Mountain (Tazewell County)

Site	Flight(s)	Type	County
Hutchinson Rock	**Fixed-wing/Helicopter**	**B**	**Tazewell**

Fixed-wing: 3 April. East-NE exposure. This is a site with two major faces that appear suitable for nesting. There do not appear to be a large number of ledges, but a closer look is warranted. Turkey vultures were observed in the area. Ground survey would be difficult with a long walk into the area and thick heavy brush above the cliff faces.

Helicopter: 6 June. One of the rock faces that appeared suitable when flown during leaf-off now appears to be partially blocked by vegetation. This could be a hindrance to peregrines that like an open view from the cliff face. There appear to be few suitable nesting ledges and these lack an adequate overhang.

Hutchinson Rock (Tazewell County)

Site	Flight(s)	Type	County
Chimney Rock/Morris Knob	**Fixed-wing/Helicopter**	**A**	**Tazewell**

Fixed-wing: 3 April. South-SE exposure. Long stretch of rock outcrops atop Knob Mountain. There are several cliff faces that appear suitable for nesting while others appear too smooth, lacking any sizable ledges. There is a lookout tower at the south end of the mountain suggesting possible access from above. Access from below would be steep and difficult. Turkey vultures were observed along several sections.

Helicopter: 6 June. This is one of the most extensive rock outcroppings in Virginia. Several of the outcrops appear to have suitable nesting ledges, but no raptors or whitewash was observed. Turkey vultures were observed flying over several sections of the mountaintop. This site appears to have great potential for nesting peregrines but may be limited by suitable nesting ledges. Closer inspection of the cliff faces is warranted.

Chimney Rock/Morris Knob (Tazewell County)

Site	Flight(s)	Type	County
House and Barn	**Fixed-wing/Helicopter**	**A**	**Tazewell**

Fixed-wing: 3 April. South-SE exposure. This site was observed while traveling between Brumley Mountain and Chimney Rock/Morris Knob. We did not have time to survey the site but collected UTM coordinates for the helicopter flight.

Helicopter: 6 June. This is a fairly extensive rock outcropping atop House and Barn Mountain. There appear to be adequate nesting ledges along a couple of the outcroppings. Some of the rock faces are smooth and lack suitable nesting ledges. Turkey vultures were observed flying around several of the outcrops. Site is accessible by ground, but the hike appears to be steep and difficult.

House and Barn (Tazewell County)

Site	Flight(s)	Type	County
Redrock Mountain	Fixed-wing/Helicopter	A	Smyth

Fixed-wing: 3 April. East-SE exposure. The rock appears too loose, broken and unstable to be a good site. Closer inspection should be made to determine the status of this site. Ground access appears feasible along old logging roads. No raptors or whitewash was observed at the site.

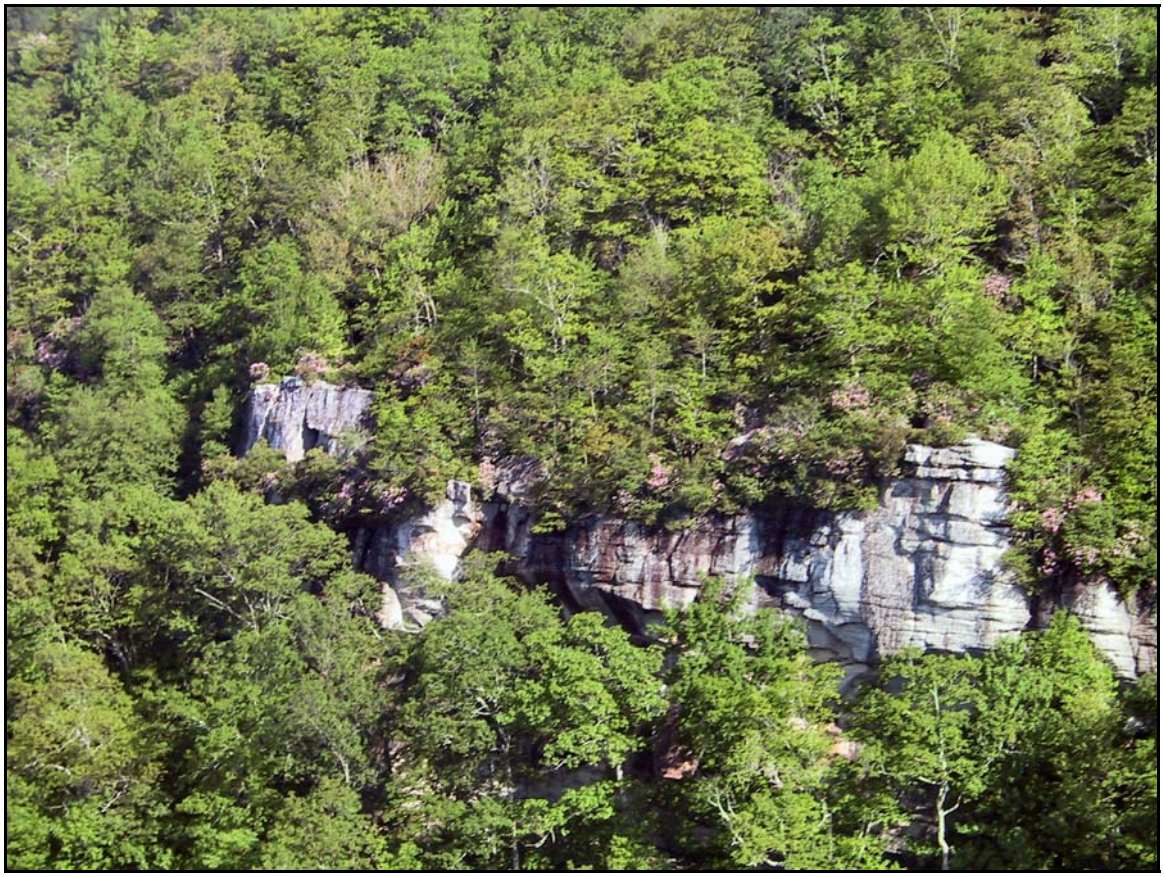
Helicopter: 6 June. The rock is loose, broken and highly unstable with no suitable nesting ledges apparent. This site does not have good potential for supporting nesting peregrine falcons. The site should be dropped from future surveys or surveyed in conjunction with other efforts in the immediate area.

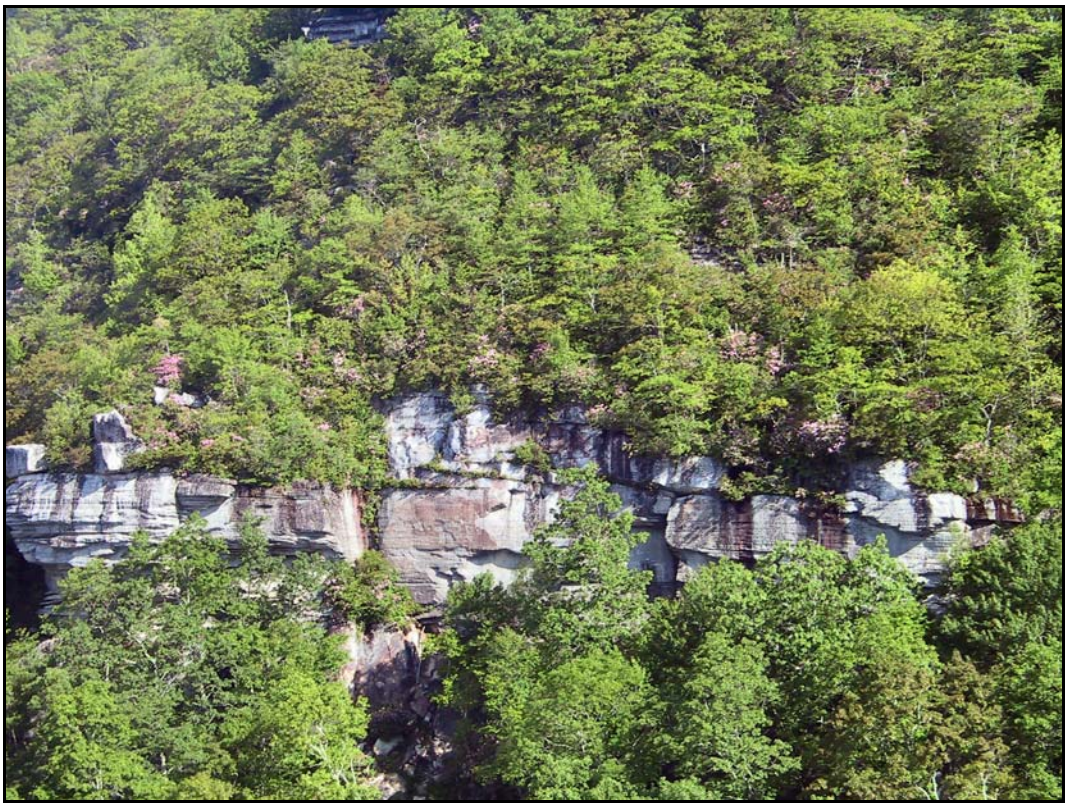
Redrock Mountain (Smyth County)

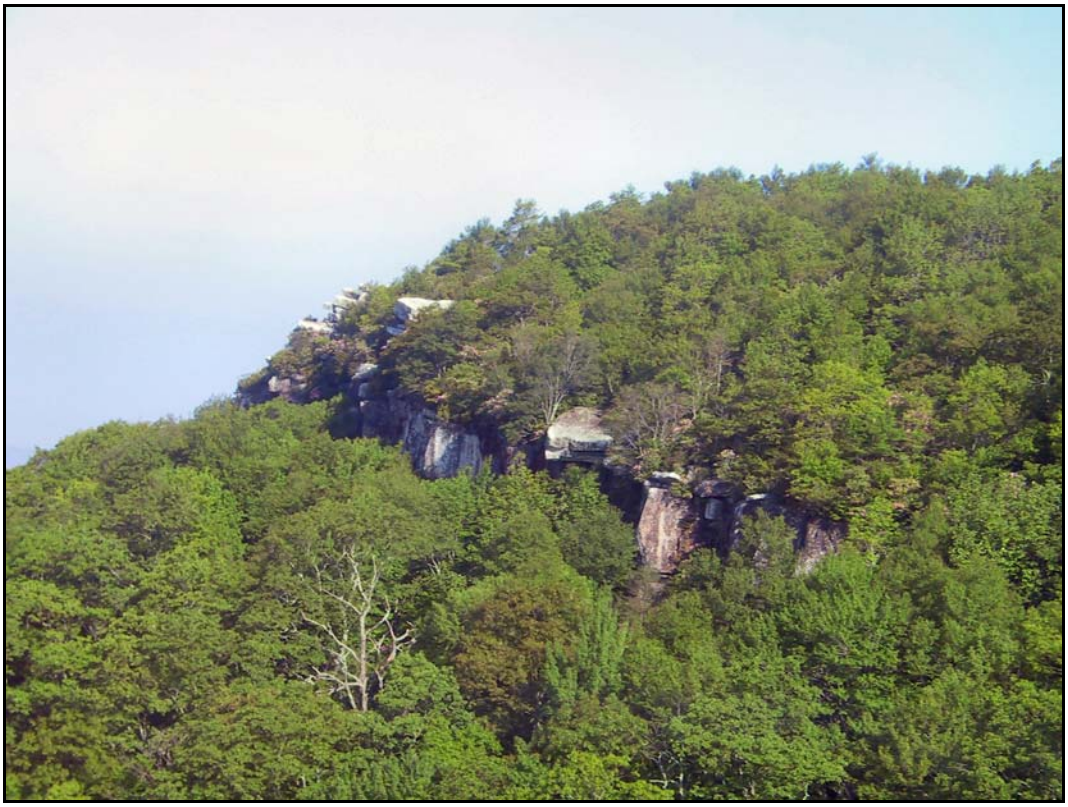
Site	Flight(s)	Type	County
Brumley Mountain	**Fixed-wing/Helicopter**	**B**	**Washington**

Fixed-wing: 3 April. South-SW exposure. This site is comprised of several smaller rock outcroppings. There appear to be no suitable ledges for nesting. Vegetation is encroaching and obscuring the cliff faces. No raptors or whitewash was observed. Access into the site appears difficult with no observable trails or roads.

Helicopter: 6 June. Closer inspection with helicopter did not reveal suitable nesting ledges. Vegetation growing on and in front of the cliff faces detracts from the potential of this site. No whitewash or raptors was observed in the area. Closer inspection on ground is warranted to determine ledge availability and management options.







Brumley Mountain (Washington County)

Site	Flight(s)	Type	County
Towers	**Fixed-wing/Helicopter**	**H**	**Dickenson**

Fixed-wing: 3 April. Multiple aspects. This is an historic site with several cliff faces with different exposures. Some of the cliff faces appear too smooth and lack sizable ledges. Some of the faces could be surveyed from the ground. No raptors or whitewash was observed.

Helicopter: 6 June. There are suitable ledges on a couple of the cliff faces. Others appear too smooth, lacking adequate nesting ledges. Some of the faces could be observed from the ground while access to others would be difficult. Whitewash was observed on the lower section of one of the faces, however no raptors were observed in the area. This site is part of Breaks Interstate Park and it would seem reasonable that staff or visitors would notice peregrines utilizing the area.

The Towers (Washington County)

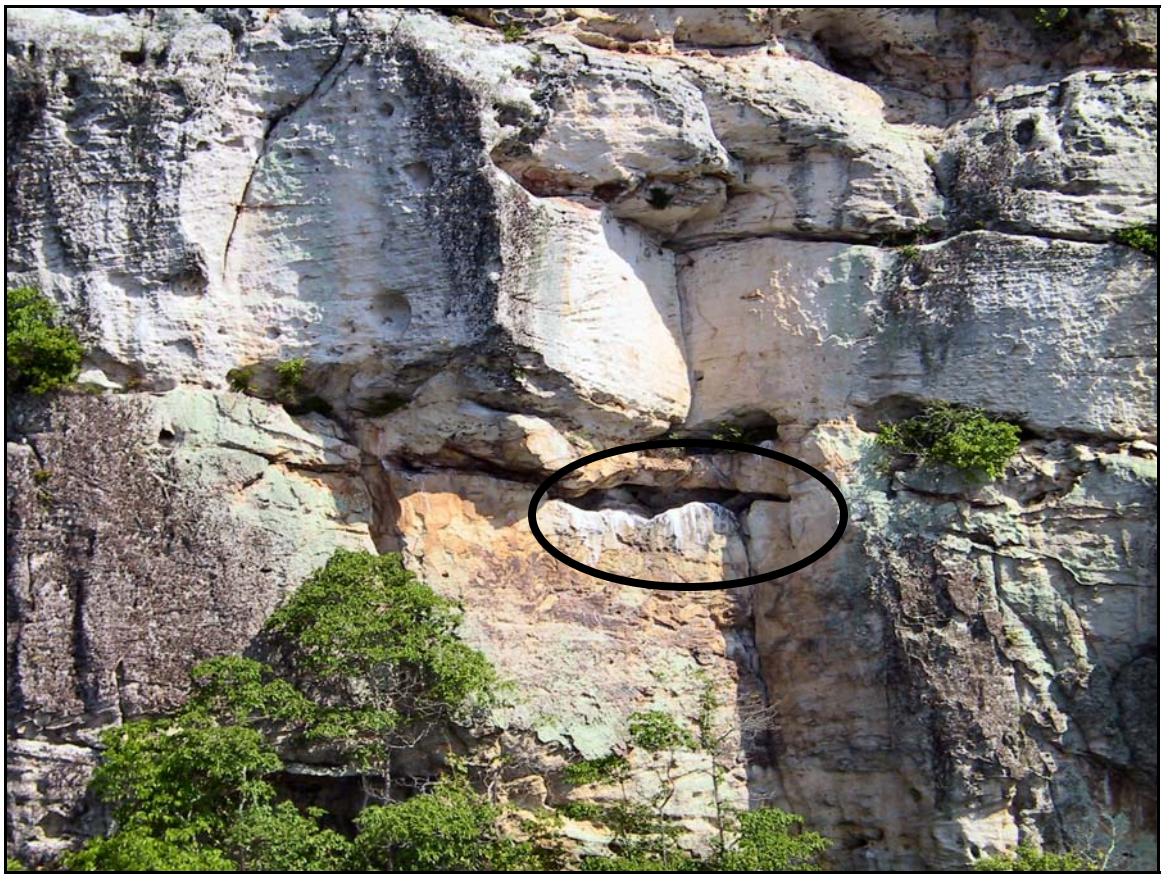
Site	Flight(s)	Type	County
Powell River/Hilton	**Helicopter**	**B**	**Lee**

Helicopter: 6 June. North-northwest exposure. This is a site identified by Baker et al. situated along the Powell River. The cliff face is small, low in elevation, and overlooks the Powell River. There appear to be few if any ledges due to the relatively smooth surface of the rock. Vegetation is encroaching in front of the rock outcrop as well as on the face itself detracting from the potential of this site. This site appears to have low potential for use by peregrines due to its physical characteristics. No raptors or whitewash was observed.

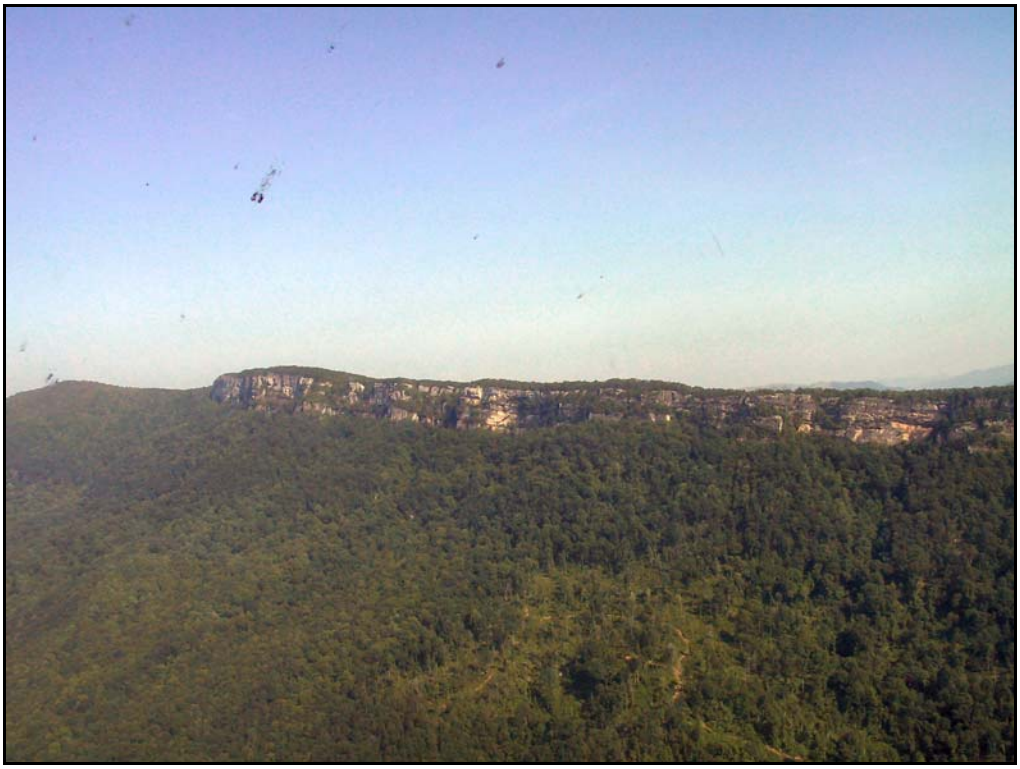
Site	Flight(s)	Type	County
White Rocks	**Fixed-wing/Helicopter**	**A**	**Lee**

Fixed-wing: 3 April. South-SE exposure. This is a very long stretch of rock at the top of Cumberland Mountain separating Virginia and Kentucky. This is the best looking site for nesting peregrines in the state. Multiple ledges and cavities are available. Ground survey would be difficult due to poor access. Turkey vultures were observed at several points along the cliffs.

Helicopter: 6 June. Multiple ledges and cavities are located along the cliff faces. Two cavities had substantial amounts of whitewash as well as "perches" close to the cavities. The shadows in the first cavity made it impossible to notice if birds were inside or not. This cavity did not appear to contain stick material, perhaps alleviating use by ravens. The second cavity appeared to contain stick and leaf material. Turkey vultures were observed along several sections of the rock outcrops. This site would benefit from a ground survey, but access will be difficult.



Oval identifies ledge with significant whitewash.



White Rocks (Lee County)
Oval identifies ledge with significant whitewash.

Recommendations

An extensive survey for nesting peregrine falcons in the mountains of Virginia had not been conducted in close to ten years. During this time surrounding states have identified successful peregrine eyries. In 2000, North Carolina documented 10 pairs with six sites producing young. Our survey focused on what we considered the most promising cliff sites for supporting nesting peregrines in Virginia. While no individuals or nesting pairs were located, we identified key sites for additional survey and potential hack sites.

Three sites, Big House/Little House, The Towers (Breaks Interstate Park), and White Rocks all have ledges with significant whitewash. While we were unable to identify the species utilizing the ledges, these sites all warrant further survey. Additional helicopter flights and ground surveys should be conducted at these sites to determine what species are occupying the ledges and the potential for hacking peregrines.

Several sites, including Chimney Rock/Morris Knob, House and Barn Mountain, and Buck Mountain/Dial Rock, contain extensive rock outcrops and ledges that appear suitable for nesting peregrines. These sites should receive additional helicopter flights and ground surveys to identify suitable nesting ledges, raptor use, and potential for hacking.

Three additional sites identified by Baker et al., Hutchinson Rock, Brumley Mountain, and Redrock Mountain, appeared promising during the fixed-wing flight. Upon closer inspection, two of the sites, Hutchinson Rock and Brumley Mountain revealed tall trees encroaching on the cliff faces and the lack of adequate nesting ledges. However, both sites are in the vicinity of Dial Rock/Buck Mountain, House and Barn Mountain, and Chimney Rock/Morris Knob and should be visited when aerial surveys are conducted at these sites. Redrock Mountain turned out to be a highly broken rock outcrop that appears unstable and lacks suitable ledges. This site should either be dropped from aerial surveys or surveyed only in conjunction with other work in the immediate area.

The area between Dial Rock/Buck Mountain and Brumley Mountain contains various rock outcrops on several of the mountaintops. We were able to survey several of the larger outcrops, but did not visit all the available sites. This whole chain of outcrops warrants additional work to identify and prioritize sites for both aerial and ground surveys.

All the historical sites should be surveyed from the ground to confirm suitability for nesting, habitat management considerations, and potential for hacking. The following are site-by-site recommendations for each historical site we visited.

1. Barney's Wall appears to have deteriorated due to exfoliation of rock. This site should be assessed from the ground to determine if suitable ledges remain.
2. Rip Rap contains several outcroppings that appear to be overgrown with tall trees and vegetation on the cliff faces. Ground assessment should determine the extent of vegetation around and on the cliff faces, determine the potential for vegetation management, and identify suitable nesting ledges.
3. Nichol's Knob appears to be suitable for nesting. A ground survey should be conducted to determine if suitable ledges are available and if the site is being used by any raptors.
4. The Towers (Breaks Interstate Park), as mentioned above, should be surveyed extensively from the ground to identify suitable ledges and raptors using the cliff. Access to some of the cliff faces will be difficult due to the lack of trails and roads.
5. New Market appears to be highly fractured and should be evaluated for suitable nesting ledges. Vegetation is encroaching on some of the cliff faces and the extent of encroachment should be documented.
6. Fort Valley appears to be highly fractured and overgrown with vegetation. This site may no longer be suitable for nesting. Ground surveys should be conducted to determine the potential nesting status of this site.
7. Jump Mountain contains suitable ledges that could support nesting peregrines. This site should be visited to determine extent of suitable ledges and current use by raptors.
8. Riven Rock appears to be completely overgrown with vegetation. This site should be visited to confirm its status and possible management alternatives.

Several old hack sites were visited as part of this effort. Elliot Knob and Cole Mountain are two hack sites on U.S. Forest Service property utilized in the early 1990's. Both of these sites appear unsuitable for nesting peregrines due to the lack of rock outcrops and suitable ledges and should be dropped from future survey efforts. Elliot Knob is an old fire tower that was utilized for hacking. Cole Mountain is a high elevation site in the Blue Ridge Mountains that has good road access, but lacks suitable nesting cliffs. Big Schloss is a hack site on Forest Service land that warrants an additional ground survey. This site appears to have suitable ledges, but may not be a promising site due to human disturbance. The rocks are close to a popular hiking trail that receives heavy traffic.

Three secondary sites on the Shenandoah National Park were surveyed during this effort. All three sites are highly deteriorated and provide little if any nesting habitat for peregrine falcons. These sites should be surveyed from the ground to confirm status and suitability. Aerial surveys of these sites should only be conducted in conjunction with other work in the immediate area.

In conclusion, there are several good sites that could support nesting peregrine falcons and on further survey may prove to be housing nesting pairs. A general observation for many of the cliff sites is the encroachment of vegetation both in front of and on the cliff faces. This may or may not prove to be a deterrent to peregrines. In North Carolina peregrines use cliffs that are vegetated and will nest on ledges obscured with vegetation (Allen Boyton, pers. comm.). Some of the sites show signs of weathering and are highly deteriorated. Evidence of recent collapse and fracturing of rock from cliff faces suggest the loss of ledges that may have supported nesting birds historically. Despite the changes occurring to many of the sites, there appears to be adequate nesting habitat to support breeding pairs in Virginia. While aerial surveys provide a convenient "birds eye" view of a cliff face, the economics of flying usually prohibits an extended survey of any one cliff. The ability to "ground truth" a site is a necessary step in evaluating a site. As a first step, additional helicopter and ground surveys should be conducted at the following sites: White Rocks, The Towers, Big House/Little House, Chimney Rock/Morris Knob, House and Barn Mountain, and Buck Mountain/Dial Rock. In addition, the historical sites should be surveyed from the ground to determine the status of suitable nesting ledges, potential for managing vegetation, and current use by raptors. If peregrines are not observed at these sites, and they have the physical characteristics for supporting nesting falcons, then consideration should be given to establishing hacking efforts at sites that are logistically feasible.

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