# Western Pennsylvania Conservancy



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RE: Draft Environmental Assessment and Draft Finding of No Significant Impact of the Proposed Duke Low MOA

Dear Ms. Kucharek and Major Andrieu:

This letter is in response to the request for public comment regarding the draft environmental assessment (EA) and draft finding of no significant impact (FONSI) for the Duke Low Military Operating Area (MOA). We appreciate the opportunity to provide input.

The Western Pennsylvania Conservancy (WPC) protects and restores exceptional places to provide our region with clean waters and healthy forests, wildlife and natural areas for the benefit of present and future generations. A private, nonprofit, conservation organization founded in 1932, WPC has helped to establish 11 state parks, conserved more than a quarter million acres of natural and agricultural lands, and protected and restored more than 3,000 miles of rivers and streams. The Conservancy also houses the commonwealth's Pennsylvania Natural Heritage Program, which is a partnership focused on the collection of scientific data concerning natural resources, including species, ecological communities, and habitats. The work of the Western Pennsylvania Conservancy is accomplished through the support of more than 9,500 members. We also describe in greater detail our involvement in the region affected by the proposed action later in this letter.

#### RECOMMENDATIONS

Our concerns with the proposed Duke Low MOA fall into three categories: negative impacts to the natural and biological resources of the area, negative impacts to the recreational experience and quality of life for residents and/or visitors, and the need for additional public outreach to stakeholders.

For the reasons detailed below, the Western Pennsylvania Conservancy respectfully disagrees with the finding of no significant impact and believes that <u>a full environmental impact statement (EIS) should be prepared</u>, as required by the National Environmental Policy Act.

### PUBLIC INVOLVEMENT

As part of the EIS, a robust level of public engagement should occur, including notification of and outreach to stakeholders from beyond the immediately affected area. To account for the wide variety of interests in the region, the Air National Guard (ANG) should expand the public outreach to include all of Pennsylvania and neighboring states, as well as local, regional and national associations that represent the wide variety of recreational activities mentioned in this letter.

Furthermore, we request that the public comment period be further extended and that a full array of public meetings occurs. These meetings should be in multiple formats including in-person, online and hybrid where appropriate. They should be scheduled at a variety of times and days of the week, in order to facilitate the greatest level of participation possible.

Better quality information related to mapping, such as large format, high-resolution maps and detailed GIS files should be made available to the public. The low-resolution of the maps included in the draft EA limits their usefulness.

The Environmental Protection Agency letter enclosure of September 26, 2019 encouraged the ANG to "develop a robust public outreach plan to engage the potentially impacted residents, businesses and recreational users." It is not clear whether the Air National Guard made efforts to solicit public input from beyond the immediate geographic area. While residents are the primary affected group, since they will be living with the flights occurring on a frequent basis, visitors to the area are also important stakeholders that should be fully engaged as we detail in this letter.

#### IMPACTS TO BIOLOGICAL RESOURCES

In the opinion of WPC's science staff, the "Biological Resources" section of the EA is insufficient for the purposes of determining the full extent and severity of impacts. Conclusions are drawn regarding some issues without adequate, scientific proof. The use of citations to scientific literature is limited and lacking in the first part of this section. The document focuses on noise as the primary issue of disturbance, without recognizing the implications of visual and other impacts on wildlife. Another mistaken assumption is that low-level flights, if temporarily disturbing to wildlife, are brief, and afterwards conditions return to normal. The document conclusions also include the misconception that if wildlife is not significantly harmed, the impact of the activities is negligible, ignoring the notion of wildlife harassment. The intention of the proposed Duke Low MOA management is to avoid sensitive areas; however, these are numerous, including some that shift over time. We feel that a full EIS could benefit from the involvement of a wider array of expertise and result in a more thorough examination of these impacts.

We disagree with the frequent claims in the draft EA that "...there will be no ground-disturbing activities..." and that the effects on wildlife "...will be negligible." Wildlife on the ground, in trees and flying nearby will be disturbed by tremendous levels of jet noise, visual sensations of fast flying maneuvering jets, and jet induced vibrations, including the resulting air turbulence.

It is clear that establishing the Duke Low MOA in this region has the unavoidable likelihood to be in conflict with and have a significant impact on wildlife.

# High-Value Ecological Areas

The PA Wilds, and in particular the region proposed for the Duke Low MOA, is some of the wildest, least disturbed, extensive and high-quality wildlife habitats in Pennsylvania and the northeastern states. There

are two National Audubon Society Important Bird Areas (IBA)<sup>2</sup> in the proposed Duke Low MOA: Susquehanna Headwaters Forest Block (continental significance) and Tamarack Swamp (state significance). These IBAs are recognized for the important expansive forest habitats, unusual bird species and the density and abundance of forest interior neotropical migrant species. The Pennsylvania Game Commission (PGC) has undertaken the Important Mammal Areas (IMA) project<sup>3</sup>, which has identified the Northern Allegheny Plateau IMA that overlaps with a significant portion of the Duke Low MOA. The wilderness condition and high-quality ecological character of this region is also demonstrated by the number and overlapping acreage of Pennsylvania natural areas (five, 8,960 ac), wild areas (two, 35,445 ac), state forests (four, 406,250 ac), state parks (ten, 29,053 ac) and game lands (seven, 35,962 ac). Part of the mission of all of these areas is to provide wildlife with exceptional protected habitats.

## **Habitat Connectivity**

Due to the extensive unbroken and undisturbed forest and other habitats, the PA Wilds, including the proposed Duke Low MOA, is a key area that allows wildlife movements from north to south and east to west. Migration, immigration and dispersal are important factors maintaining wildlife population health. In terms of the system of landscape connectivity, 64% of the MOA has been assessed as high- or very high-quality core habitats and connecting corridors. These areas are important for wildlife and even more so as the climate changes and wildlife movements are forced to become more extensive. An increase of disturbance in this area will lower the connectivity value of the region for wildlife.

### Sensitive Areas

The draft EA does not include state forest natural areas in its inventory of biological resources. Pennsylvania Department of Conservation and Natural Resources' Bureau of Forestry natural areas represent the highest ecological quality and protection designation for any state land and represent important wildlife habitats.

# **Altitudinal Mitigation**

We note that two state forest natural areas, Tamarack Swamp Natural Area and Pine Tree Trail Natural Area, are not provided mitigation altitudes to reduce disturbance of these sensitive areas. Since natural areas are some of the most ecologically significant management units in the state, it is inconsistent to mitigate flyovers for the other natural areas but not for these two. In particular, Tamarack Swamp is a rather open wetland, and wildlife occurring there during low flyovers will experience greater exposure and receive more shock. Similarly, Ole Bull State Park is not provided a flyover mitigation altitude, while the other state parks in the area of the proposed Low MOA are.

The draft EA indicates that the proposed mitigation altitude designations are primarily related to recreational use of the selected areas; however, wildlife should also be taken into consideration. In particular, waterfowl, bald eagles and other water related birds, e.g. great blue herons, utilize bodies of water and the larger streams in the area. Because these habitats are open, wildlife are vulnerable to low, loud, jet overflights that alarm the birds and cause them to flush. This situation can occur at the impoundments in Kettle Creek, Sinnemahoning and Lyman Run state parks and along the larger streams in the area, which in some reaches have received no mitigation altitude designations, including Kettle Creek, First Fork Sinnemahoning Creek, Driftwood Branch Sinnemahoning Creek, Pine Creek and potentially the Allegheny River.

The Pennsylvania Natural Heritage Program<sup>5</sup> database has compiled data regarding six separate great blue heron rookeries, or nesting colonies, located within the proposed Low MOA boundary from 1983-2008 (year documented). This large bird nests high in tree tops and in colonies of a few to over 100 nests, and the rookeries can be found at various elevations, including higher ridge lines. When nesting, this species is very susceptible to human disturbance from late winter into early summer. Rookery locations are often

used for several years and then the colony moves to a new site. Great blue heron nesting rookeries should receive the same mitigation protection as bald eagle nests.

In their study of five heron species responding to military overflights, Black et al (1984) noted that the birds nesting higher in trees (i.e. similar to the great blue heron) responded more to fly-overs, and that "No evidence of habituation to overflights was noted." We postulate that habituation is more likely with frequent disturbance, while infrequent disturbance events are more likely to elicit a response each time, as the disturbance is regarded as a new event.

### Visual Effects

The Air National Guard determined that Visual Effects would not be carried forward for analysis. Lowey et al (1994) identifies "visual cues" as a factor in the disturbance of wildlife by overflights. We disagree with the finding that visual effects are inconsequential and that low flying jets will not create a threat alarm response from wildlife. In addition to the experience of observing a loud, fast, low flying jet overhead, the vibrations and air vortexes created by these jets add unfamiliar stimuli that will likely be perceived as threats by some wildlife. Therefore, Visual Effects should be incorporated in a full analysis performed as part of an EIS.

#### Noise

The impact of noise pollution on wildlife is well-documented. The stress of sudden, loud, anthropogenic noises affects terrestrial and avian species and results in significant changes to animal behavior including but not limited to: foraging behavior, anti-predator behavior, reproductive success, roosting, density and community structure, migration patterns, mating activity, pollination, and migration or predation patterns.<sup>8</sup>

The draft EA failed to adequately describe or account for these effects. In the draft EA, the Air National Guard primarily based their assessment of minor effects on biological resources on the fact that chaff, flares, ammunition, etc. would not be deployed. The authors also concluded, without sufficient basis, that long-term noise effects would be effectively not much different than short term noise effects.

"Short-term effects would be due aircraft overflight noise during training exercises. These effects would cease and return to existing conditions when aircraft are not periodically flying overhead. Long-term effects would be similar in nature and overall level as the short-term effects." -- page 3-45

The negative effects of noise on wildlife do not merely dissipate once the noise has ceased. Also, cumulative effects of noise on wildlife require much further analysis.

In summary, as stated by Barber J.R., Crooks K.R. and Fristrup K.M. (2010) "Effective management of protected areas must include noise assessment, and research is needed to further quantify the ecological consequences of chronic noise exposure in terrestrial environments." This statement is relevant to the proposed Duke Low MOA given that one-third of the area is protected public lands, yet a thorough noise study has not been undertaken to date.

### Elk

Regarding the protection of elk from disturbance in the proposed Duke Low MOA, one of the questions is knowing the location of portions of the elk herd related to where training includes low altitude passes, which are particularly alarming to elk. Manci et al (1988) summarized the findings of studies evaluating the effects of noise on ungulates and other animals. For another ungulate, the caribou (*Rangifer tarandus*), three studies found that low-altitude fixed-wing and helicopter aircraft at less than 200 feet caused "running and panic behavior", while those same aircraft at less than 500 feet produced "escape or strong

panic reactions" and what was classified as "general noise" resulted in "increased incidence of miscarriages; lower birth rates". A study in Yellowstone pertaining to snowmobile disturbance also found elk to be responsive 52% of the time, with reactions varying from moving away from the disturbance to "...flight or defense", indicating that elk are responsive to different types of perceived threats. 11

Through his intensive study, Leib (1981) showed disturbance would cause elk to shift habitat usage, e.g. logging and road construction caused an average displacement of 0.9 miles. He states that "...elk preferred area with low noise levels." Such displacements can be problematic when elk escape disturbance and disperse to habitats of lesser quality, which can ultimately affect their health. Elk and other ungulates that are pressured by disturbance to disperse from their chosen habitats is especially detrimental in the winter when they are less fit, under more stress, experiencing more metabolic costs, more vulnerable to predation and when winter conditions might challenge them to disperse effectively. The EA does not mention that there will be any seasonal variation in training during times of the year when elk are especially vulnerable.

## Waterfowl

Another group of wildlife that are vulnerable to low-flying jets is waterfowl. The draft EA states that there are 1,367 acres of open water within the proposed Duke Low MOA, and this represents habitat for many species of migrating waterfowl as well as for species breeding in the region. Waterfowl will be disrupted from resting and/or feeding and flush from water bodies. Additionally, they will also avoid flying aircraft by changing flight direction. One example study by Belanger and Bedard (1989) examined the disturbance of greater snow geese at a bird sanctuary. Of the 652 disturbances observed, where all or part of a flock was flushed from the water, at least 45% of these disturbances resulted from low-flying aircraft, and the entire flock was disturbed in 20% of all events. Furthermore, when the disturbance was relatively frequent (more than two events per hour), the number of snow geese was reduced by half in the sanctuary the following day. Furthermore, Ward et al (1986) discovered that black brant geese sensitized to aircraft disturbances would still flush from their position on water when a helicopter was three kilometers away from them. Is

#### Bats

The EA does not effectively address the conservation of bat species. There are 11 records of the federally threatened/PA endangered northern long-eared bat and one occurrence of the PA endangered little brown bat (*Myotis lucifugus*) in the proposed Low MOA. The EA concludes that the hibernaculum in Clinton County is not within the Low MOA, and that elsewhere there will be no ground disturbance. However, the loud sounds, vibrations and vortexes generated by low jet flights could nevertheless affect summer roosts and maternity colonies. Airborne collisions with bats are also a threat. Peurach, Dove and Stepko (2009) analyzed 821 bat collisions with military aircraft from 1997-2007. Of those where the dead bat could be located and identified, 16 individuals were tricolored bats (*Perimyotis subflavus*) and two were little brown bats, both PA endangered species, not counting bats that could not be fully identified. <sup>16</sup>

### Newly-Listed Threatened and Endangered Species

The Northern goshawk (*Accipiter gentilis*) was added to Pennsylvania's list of state endangered species on October 23, 2021, and it should be added to Table 3-12 Federal and State Listed Threatened and Endangered Species.<sup>17</sup> Impacts to the northern goshawk are absent from the draft EA. Ten goshawk nests have been documented within the MOA from 1990 to 2017.<sup>5</sup> This raptor is sensitive to human disruptions. Roby et al (2002) did note that for the peregrine falcon (*Falco peregrinus*), a similarly sensitive raptor, "[t]hus higher intensity of response to jet overflights was associated with lower nesting success ..." We anticipate a comparable response from the lower flight altitudes of military jets over goshawk nests at the MOA. Jones (1979) recommended a 400-500 m "...disturbance-free buffer zone radius", and Richter (2005) proposed no management activities within 400 m of nests. While these

recommendations are based on human ground activities, they may be used to inform consideration of loud, fast, low flying jets. Locations of goshawk nests should be identified and provided altitudinal mitigation buffers similar to those provided to the bald eagle.

## Non-Representative Indicator Species

Using "reptiles, amphibians, fish, and invertebrates" (page 3-36) to define ground-dwelling wildlife, while not mentioning wildlife more likely to be affected (e.g. black bear, bobcat, white-tailed deer, wild turkey, great blue heron and pileated woodpecker) is an inadequate representation of the impacts on biological resources. Furthermore, some reptiles are very sensitive to vibrations, as well as visual stimuli, e.g. timber rattlesnake, and could be affect by low jet passes.

Also, the least shrew and spotted skunk do not occur in the boundary of the proposed Duke Low MOA and as such are not representative wildlife species.

### Miscellaneous Errors and Omissions

- The Duke Low MOA is not located in the Appalachian Mountains. It is located in the Deep Valleys Section of the Appalachian Plateaus Province.
- The common name of the least shrew on page 3-40 is misspelled.
- The first sentence of the second paragraph is incorrect, as there are many more than 17 migratory bird species that are known or expected in the Duke Low MOA; likely more than 100 species.
- In the last paragraph on page 3-36, the Pennsylvania Game Commission and Department of Conservation and Natural Resources must be included as state agencies with jurisdiction over birds, mammals and plant species, respectively. Likewise, on page 3-45 in the first paragraph under Significance Criteria.

# IMPACTS TO RECREATIONAL EXPERIENCE

Pennsylvania's public lands are the cornerstone of our \$19.8 billion outdoor recreation and tourism industry<sup>1</sup>. Thirty-six million people visit Pennsylvania each year. In 2019, the travel and tourism industry was the 11<sup>th</sup> largest employer in the commonwealth. Pennsylvania's outdoor recreational assets include: state game lands, state parks, state forests, wilderness areas, streams and rivers, hiking trails, water trails, multi-use trails, canoe access points, campgrounds, bicycle routes, lakes, impoundments, scenic byways, natural areas, and greenways, just to name a few.

The draft EA states that low level overflights will be briefly loud enough to interrupt conversation between individuals on the ground, and that an aircraft operating in the MOA will be disruptive to conversations over an area of 2.4 square miles on average. This is obviously also loud enough to disrupt or adversely affect the outdoor recreational experience for anglers, backpackers, cyclists, campers, hunters, day hikers, wildlife watchers, horseback riders, photographers, astronomers, canoeists and other groups.

Most of the people engaged in the above activities count the solitude and peace found in nature to be an essential part, if not the centerpiece, of their pursuits. Furthermore, activities that involve animals, such as hunting, horseback riding, and wildlife watching, have the potential to be further disrupted by extremely low altitude overflights. A very real concern is that tourists will simply choose other destinations, thereby resulting in a loss of income and quantifiable economic harm to the local businesses that depend on these outdoor recreation visitors.

The risk of distraction is another consideration for those activities that possess an element of danger. A hiker traversing a slippery ridge, an angler wading through fast currents over a streambed of moss-covered rocks, and a hunter who is aiming at his or her quarry during a busy hunting season are all examples of situations where human safety is dependent on the individual's concentration. The sudden appearance of a A-10C jet flying 100 feet overhead can and would almost certainly break that concentration. Horseback riders may experience an increased risk of startled, hard-to-control animals that are caused by the sudden appearance by large, low-flying aircraft.

## THE 'PA WILDS'

The proposed Duke Low MOA boundary is wholly within the recreational landscape known as the PA Wilds, a thirteen-county region in north-central Pennsylvania. The PA Wilds is a designated Conservation Landscape of the Pennsylvania Department of Conservation and Natural Resources (DCNR).

The region is well-established as a popular destination for outdoor recreation, on the strength of its remote beauty and bountiful natural assets. It comprises 2.1 million acres of public land, two national wild & scenic river corridors, 50 state game lands, 29 state parks, eight state forests, and hundreds of miles of scenic roads and recreational trails. DCNR has invested \$130 million in infrastructure improvements to state parks and forests

The PA Wilds is a regional engine for the outdoor recreation economy. Every year 7.2 million people visit the PA Wilds to spend time and money in the great outdoors. The PA Wilds is home to unique attractions such as a dark skies state park that carries an International Dark Skies Association gold-level designation and Pennsylvania's only wild elk herd. Thousands of miles of Class A and Wilderness trout streams draw anglers from throughout Pennsylvania as well as neighboring states. Spectacular fall foliage provides another reliable, seasonal draw.

Overall, the outdoor recreation economy represents \$89.8 billion in consumer spending, 708,000 jobs, \$7.0 billion in federal tax revenues and \$6.7 billion in state and local tax revenues in just the Middle Atlantic region (New York, New Jersey and Pennsylvania) alone.<sup>21</sup>

The PA Wilds generates a \$1.8 billion in nature and heritage tourism of the region, accounting for a full 11% of the region's total economy. Over 375 local rural businesses are affiliated with the Wilds Cooperative of PA. This is not by accident or happenstance but through a strategic and coordinated marketing and promotion effort designed to showcase the region as a top destination.

# WESTERN PENNSYLVANIA CONSERVANCY INVESTMENT

The Western Pennsylvania Conservancy has a long and successful history of working in the PA Wilds. WPC holds 14,167 acres of conservation easements in the PA Wilds. We have conveyed 33,472 surface and subsurface acres to the State Forest System including: Tioga State Forest, Susquehannock State Forest, Elk State Forest, Sproul State Forest, and Moshannon State Forests. We helped establish or expand two state parks in the PA Wilds: Cook Forest State Park and Clear Creek State Park. And our land conservation projects have resulted in 19,470 additional acres of state game lands. These investments go back five decades to our first conveyances in the early 1970s.

In addition to land conservation activity, other program areas at WPC have made considerable investment in the PA Wilds region, in particular the Natural Heritage Program and Watershed Conservation Program.

WPC's Natural Heritage Program has completed county natural heritage inventories for all 13 counties, identifying the key ecological resources for planning purposes. We have undertaken several extensive studies of natural communities including peatlands, floodplains of the Susquehanna, Allegheny and Genesee Rivers, and avian communities associated with a number of the forest types within the High Plateau Section that makes up a significant portion of the PA Wilds. Additionally, we have produced targeted surveys to document timber rattlesnakes, wood turtles, Allegheny woodrat, bats and rare plants for DCNR, PGC and PFBC.

Since 2004, we have had a regional office based in Ridgway, Elk County, which serves as our local platform for land conservation, stewardship, watershed conservation and other activities. We coordinate this work with the local input of an advisory committee made up of community leaders from the business, political, and conservation sectors, which reflects our commitment to a collaborative approach to working in the region. In addition, we have been involved with early planning efforts around the PA Wilds going back to approximately 2003.

It is with this long history of investment in mind that the Western Pennsylvania Conservancy is compelled to comment on the proposed action. We do not wish to see the character or the conservation values of the public lands that we have taken great care, time and expense to protect and steward negatively affected by the regular presence of low-flying military jets.

The Western Pennsylvania Conservancy looks forward to participating in additional public meetings and input opportunities as part of a full environmental impact statement process, in order to contribute to a more thorough evaluation of the impacts of the proposed action.

Sincerely,

Charles W. Bier Senior Director, Conservation Science

cc: The Honorable Cindy Adams Dunn, Secretary, DCNR

#### **CITATIONS**

<sup>1</sup> Pennsylvania Downtown Center "Pennsylvania's Outdoor Recreation Economy: Exploring the Economic Development Potential of Nature-Based Placemaking" 2021 https://padowntown.org/resource\_category/nature-based-placemaking/

<sup>&</sup>lt;sup>2</sup> Important Bird Areas, National Audubon Society; https://www.audubon.org/important-bird-areas

<sup>&</sup>lt;sup>3</sup> Important Mammal Areas, Pennsylvania Game Commission: https://www.pamammalatlas.com/mammals/important-mammal-areas

<sup>&</sup>lt;sup>4</sup> Yeany, D. 2020. Priorities for Climate Change Connectivity in Pennsylvania. Pennsylvania Natural Heritage Program. Report to PA DCNR. 48 pp. plus GIS project files.

<sup>&</sup>lt;sup>5</sup> Pennsylvania Natural Heritage Program, element occurrence database. PA DCNR & WPC, Harrisburg and Pittsburgh

- <sup>6</sup> Black et al. 1984. Effects of low level military training flights on wading bird colonies in Florida. University of FL, Technical Report No. 7. 195 pp.
- <sup>7</sup> Lowey et al. 1994. Report on Effects of Aircraft Overflights on the National Park System. Chapter 5. Effects of Overflights on Wildlife. National Park Service. 27 pp.
- <sup>8</sup> Barber J.R., Crooks K.R. and Fristrup K.M. 2010. The costs of chronic noise exposure for terrestrial organisms. Trends in Ecological Evolution. 10 pp.
- <sup>10</sup> Manci, K.L. et al. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. U.S. Fish and Wildlife Service. National Ecology Research Center, Ft. Collins, CO. NERC-88/29. 88 pp.
- <sup>11</sup> Borkowski, J.J. et al. 2006. Behavioral responses of bison and elk in Yellowstone to snowmobiles and snow coaches. Ecological Applications. 15 pp.
- <sup>12</sup> Leib, J.W. 1981. Activity, heart rate, and associated energy expenditure of elk in western Montana. Ph.D. dissertation, University of Montana, Missoula, MT.
- <sup>13</sup> Church, R.P.Bio. and Holland, B. 2003. Wildlife and aircraft operation: assessment of impacts, mitigation and recommendations for best management practices in the Peace Region. Chillborne Environmental, Fort St. John. 77 pp.
- <sup>14</sup> Belanger, L. and Bedard, J. 1989. Responses of staging greater snow geese to human disturbance. Journal of Wildlife Management, Vo.53, No.3, pp. 713-719.
- <sup>15</sup> Ward, D.H. et al. 1986. Behavior of the Pacific black brant and other geese in response to aircraft overflights and other disturbances at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Annual Report.
- <sup>16</sup> Peurach, S.C., Dove, C.J. and Stepko, L. 2009. A decade of U.S. Air Force bat strikes. Human-Wildlife Interactions. 17 3(2), pp. 199-207.
- <sup>17</sup> Pennsylvania Bulletin, Vol.51 Number 43 Page 6609, October 23, 2021.
- <sup>18</sup> Roby et al. 2002. Effects of noise on birds of prey: a study of peregrine falcons (Falco peregrinus) in Alaska. U.S. Air Force Research Lab. 264 pp.
- <sup>19</sup> Jones, S. 1979. The accipiters, goshawk, Cooper's hawk, sharp-shinned hawk. U.S. Bureau of Land Management Technical Note 335. 51 pp.
- <sup>20</sup> Richter, D.J. 2005. Territory occupancy, reproductive success and nest site characteristics of goshawks on managed timberlands in central and northern California 1993-2000. California Fish and Game, 91. pp. 100-118.
- <sup>21</sup> Outdoor Industry Association, "The Outdoor Recreation Economy" Report, 2017