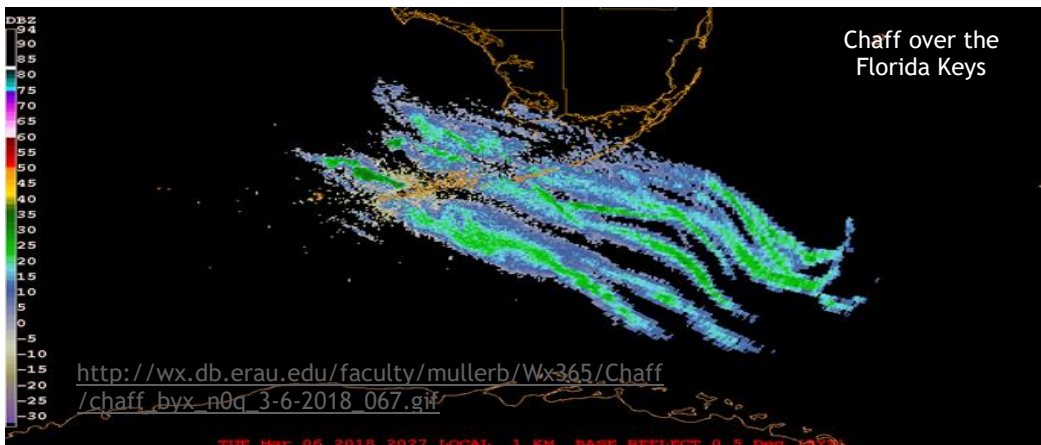


F-16 Training over the Gila

Community Input to the Environmental Impact Statement

FEBRUARY 2019



CHAFF

In its airspace optimization proposal for Holloman Air Force Base, the US Air Force has included Alternative #2, the expansion of the existing Cato/Smitty military operations areas (MOAs) and the establishment of the new Lobos MOA over the Gila region. If this alternative is chosen by the Air Force, Holloman AFB F-16 fighter jets could fire up to 15,000 bundles of military chaff into the air over Grant County. Grant County residents have significant questions and concerns about this proposal and specifically the impact chaff would have on the environment. These impacts include: I) drift of the chaff; II) chaff's impact on waters and species in the area; and III) potential for inhalation of the chaff fibers or degraded debris that have accumulated over time. An important postscript is that chaff has a secondary impact: NOISE.

Chaff consists of very small strands of aluminized fiberglass. It is well known and has been documented in many areas of the country that chaff drifts with the wind after being dropped from military aircraft, and there are no recent studies that have documented the effects or risks on public health, wildlife and the environment of this chaff drift over or outside of MOAs. The studies that are available were written in the late-1990s, and they do not address the resuspension of chaff or its breakdown in the environment. Despite the fact that these reports indicate that more study is needed on several factors (some of which apply directly to the Gila region), these are the documents that are used in environmental impact statements. Citizens justifiably have concerns about the possibility that as chaff breaks down, it may be inhaled, not only by humans but also by animals in the region. Finally, F-16 training over the Gila will increase the noise level greatly, and the practice of military aircraft maneuvers related to the use of chaff during training is expected to have a significant impact on the peaceful nature of the Gila National Forest and the Gila and Aldo Leopold Wilderness areas. This report details the concerns.

Peaceful Gila Skies

A coalition of business and community leaders, sportsmen and concerned citizens, united in our goal of protecting the Gila Region from military aircraft training.

www.peacefulgilaskies.com | 575.538.8078 | peacefulgilaskies@gmail.com

What is chaff and how is it used?

Chaff generally consists of tiny fibers of glass that are coated with aluminum. They are bundled together in cartridges that are shot out from military aircraft in flight as a radar evasion measure. The aluminized fiberglass bundle disperses rapidly in the air, forming a temporary cloud that obscures the aircraft from radar detection. This evasion technique was invented during WWII.

RR-188 chaff is available for use during training by most military aircraft. The dipoles are cut in lengths that do not interfere with the RF bands used by FAA radars so the chaff does not pose a threat to air traffic guidance. **In fact, since chaff can obstruct radar, its use is coordinated with the Federal Aviation Administration (FAA). The FAA has placed more stringent restrictions on DOD use of any type of chaff that operates within the bands used by air traffic control radar and navigational systems. In taking the more conservative approach to air traffic control and flight safety, FAA has limited or placed restrictions on the locations, altitudes, and/or time periods within which specific types of chaff can be employed.**



<http://wx.db.erau.edu/faculty/mullerb/Wk365/Chaff/usafchaff.jpg>

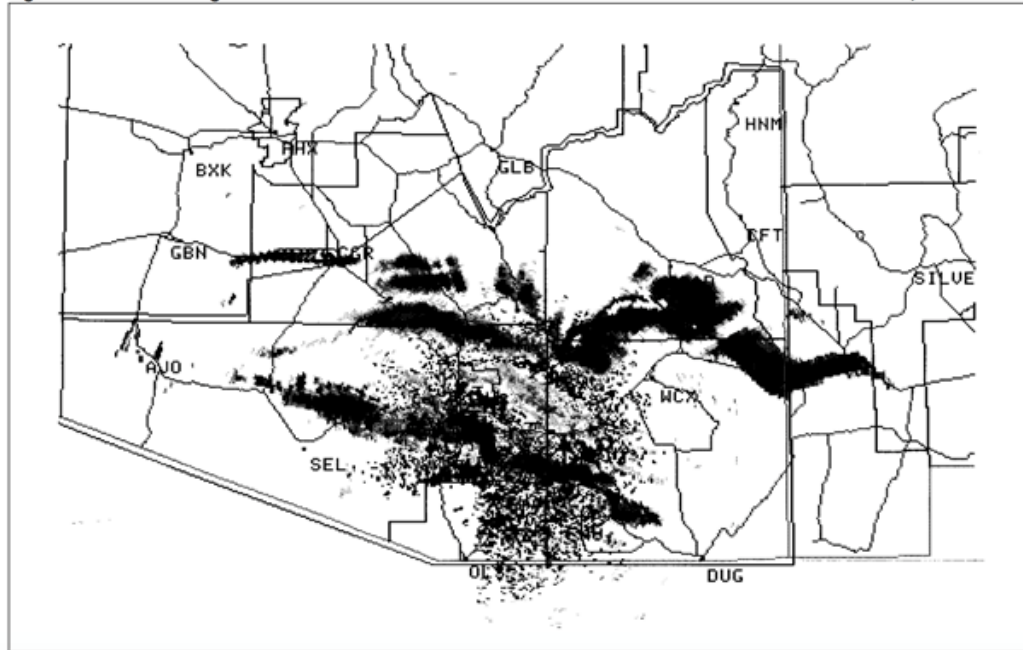
I. Drift of Chaff

What happens to chaff after the aircraft leave the training area?

Many experts believe that the cloud of fiberglass completely settles to the ground. Before settling, the cloud may drift distances that range from 500 feet to 140 miles depending on the altitude of release and depending on the wind. This range of dispersal can move chaff across a large area, well outside the borders of a particular MOA. <https://www.gao.gov/assets/230/226441.pdf>

Clouds of chaff occasionally show up on radar used by the National Weather Service. See Figure 2 below for example.


Figure 2: NWS Radar Image of Chaff Plumes Over Southern Arizona and Southwestern New Mexico on October 8, 1997.



“A scientist formerly with the National Oceanic and Atmospheric Administration (NOAA), which now performs weather research at the University of Oklahoma, estimated it would have taken more than 200 billion chaff particles to create a radar picture taken in Arizona in 1997.” <https://www.gao.gov/assets/230/226441.pdf>

The Holloman proposal does not address the issue of altitude for chaff release in the announcement that launched the current Environmental Impact Statement analysis.

Below is a more recent radar image of chaff in Florida.

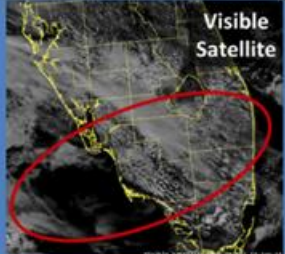
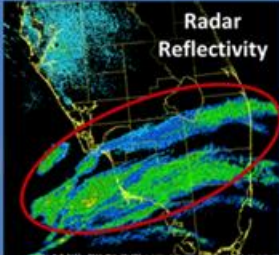
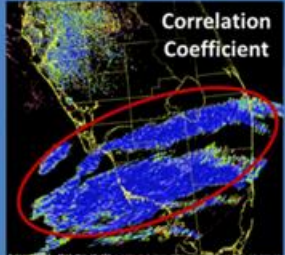
NWS Tampa Bay  [Follow](#)

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Similar to last week, chaff is showing up on radar over southwest Florida. [#FLWX](#)

Chaff on Radar

- What looks like rain on radar is actually chaff deployed by the military.
- Low values on Dual-Pol Correlation Coefficient show that what the radar sees is not actually rain.
- Also, clouds on visible satellite do not line up well with the radar returns.

11:01 AM - 13 Jan 2014

<https://twitter.com/NWSTampaBay/status/422805505786925056>

At scales like this, chaff is a problem because it can cloud the radar images used for weather forecasting. It can even alter weather because the aluminized fiberglass can suppress lightning, and in San Diego, chaff drifting onto utility lines has caused power interruptions.
<https://www.gao.gov/assets/230/226441.pdf>

The Boston Globe published another chaff cloud incident on December 18, 2018.

<https://www.bostonglobe.com/metro/2018/12/13/those-strange-radar-sightings-over-maine-were-probably-caused-military-planes-dumping-chaff/m9rBtyeyRU3Cj0hIZe0uML/story.html>

II. Impact on Waters and Species

What does research tell us about the effects of chaff? What are the effects on people and wildlife living under or downwind of the chaff cloud dispersals? What are the cumulative effects of chaff on air and water and wilderness and other assets?

Chaff's impact on waters and species is hard to say. There is not a lot of thorough research in the scientific literature. Essentially there are three major documents that address the use of chaff.

- The first document is an Air Force report that is the principal source used by military analysts preparing Environmental Assessments and Environmental Impact Statements that assess the effects of chaff. This report is cited as: *Environmental Effects of Self-Protection Chaff and Flares. Final Report*. August 1997. Prepared for U.S. Air Force. Headquarters Air Combat Command. Langley Air Force Base. Virginia.

<https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB98110620.xhtml>

This report provides a template and a table for responding topic by topic to the regulatory requirements of the National Environmental Policy Act. While noting that the scientific literature on the effects of chaff is sparse, it reports on its own research in the field and in the lab and supports the use of chaff. But even this report concedes concern and uncertainty about the effects of chaff on water and dependent wildlife, as well as on wilderness and other pristine areas.

Specifically, the Air Force report (Table 5.1.1 pages 5.2 and 5.3) mentions the issues below as requiring Site Specific Analysis:

- Small, confined freshwater environments with sensitive species, and
- Water bodies with significant waterfowl use or protected species.
- Wilderness Areas, Wild and Scenic Rivers, parks, coastal zones, outstanding visual resource areas.

- A second document is an overview by the U.S. General Accounting Office of chaff research over a 45-year period, cited as: *Environmental Protection DOD Management Issues Related to Chaff*. United States General Accounting Office. GAO Report to the Honorable Harry Reid, U.S. Senate. September 1998. <https://www.gao.gov/assets/230/226441.pdf>

The GAO report reviewed 10 research reports on the effects of chaff that were issued between 1952 and 1997, including the Air Force report. Nine of the reports were performed by components of the Department of Defense. The leading conclusion of the GAO report is that:

“Studies by DOD and others, including some carried out years ago, continue to create questions in the public’s mind about the health and environmental effects of chaff. Department records indicate that DOD has not systematically followed up on these reports to determine the merits of any outstanding question or the costs and benefits of addressing them.” (page 14)

“While none of the studies we reviewed demonstrated significant operational or environmental effects of chaff, 9 of the 10 reports cited gaps in information on potential effects. Six of the nine made no recommendations but cited missing data, suggested additional studies or long-term monitoring, or cited possible long-term chronic effects. Three reports recommended additional studies covering chaff toxicity, long-term exposure, weathering, or other study areas. However, DOD has not reviewed the recommendations and information gaps cited in the reports in a comprehensive and systematic way to assess their merits for further actions.” (page 15)

- The third significant document that reviews the scientific literature on the effects of chaff use is cited as: *Environmental effects of RF chaff: A select panel report to the Undersecretary of Defense for Environmental Security*. Naval Research Laboratory. January 1999. Hullar, T.L. & Fales, S.L. & Hemond, H.F. & Koutrakis, Petros & Schlesinger, W.H. & Sobonya, R.R. & Teal, J.M. & Watson, John.

This panel was organized to address the research criticisms of the 1998 GAO report. Their report, published by the Naval Research Laboratory, highlights a concern that was not as clearly as expressed in previous reports -- the inhalation of chaff:

“Whereas it can be concluded from the existing literature that there is little risk from chaff as it is currently used, there is no data on the re-suspension of chaff fibers and little is known about the breakdown of chaff under relevant conditions. Thus, to address these and other gaps in our knowledge, Hullar et al. (1999) recommended in the Select Panel Report that seven questions be addressed:

1. What fraction of emitted chaff breaks up in atmospheric turbulence into inhalable particles?
2. How much chaff is abraded and re-suspended after it is deposited on a surface?
3. What are the shapes of chaff particles after abrasion?
4. What is the empirical terminal deposition velocity of chaff?
5. What is the spatial distribution of chaff clouds under different release and meteorological conditions?
6. How do chaff emissions and expected concentrations compare to emissions and concentration from other particle emitters over the time periods and areas where chaff is released?
7. **What quantities of inhalable chaff are found in communities near training facilities where chaff is released?”** [bold added for emphasis]

Note: Twenty years later, have these questions been answered? Do we really know that chaff use is safe? Research needs to be done to document the benign effects of chaff before chaff use is expanded into new areas.

How are concerns in these reports related to conditions in the Gila National Forest, Gila Wilderness, and surrounding areas? Specifically, if billions of fibers of aluminized fiberglass are discharged into the air over the proposed new Lobos MOA and existing Cato/Smitty MOAs every year, year after year, will there be any harm?

- **Water and wildlife** - The 1997 Air Force report mentions the issues below as requiring Site Specific Analysis:
 - Small, confined freshwater environments with sensitive species, and
 - Water bodies with significant waterfowl use or protected species.

These categories of water bodies cover nearly all of the aquatic environments under the Lobos MOA, with the possible but undetermined exception of some stock tanks. Consequently, additional analytical requirements should be thorough.

The streams and Rivers of the Gila National Forest are the largest source of freshwater in southern New Mexico, and they include the headwaters of the Gila River and its tributaries, as well as the headwaters of the Mimbres River and tributaries to the Rio Grande. This map by the NRCS denotes the intermittent and perennial streams of the Gila Basin. Similar maps are available for the Mimbres and the Rio Grande Basins.

Most of these streams are identified by the New Mexico Department of the Environment as Outstanding Natural Resource Waters. For streams in the Gila Basin, as an example, see the lists below.

https://www.env.nm.gov/swqb/documents/swqbdocs/Standards/ONRW/ONRW_List-Table.pdf

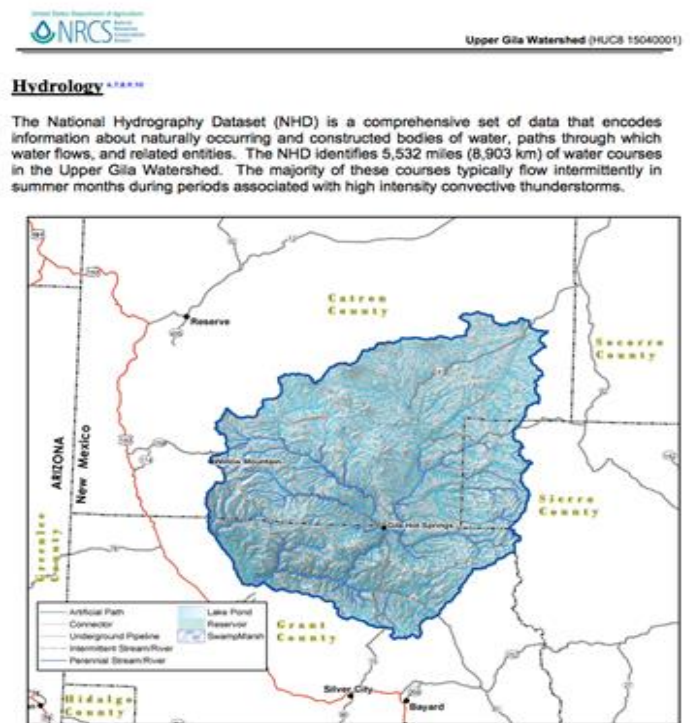


Figure 9. National Hydrologic Dataset (NHD) of the Upper Gila Watershed.

GILA RIVER BASIN

WILDERNESS	WATER NAME
Aldo Leopold	Aspen Canyon
Aldo Leopold	Black Canyon Creek
Aldo Leopold	Bonner Canyon
Aldo Leopold	Burnt Canyon
Aldo Leopold	Diamond Creek
Aldo Leopold	Falls Canyon
Aldo Leopold	Fisherman Canyon
Aldo Leopold	Running Water Canyon
Aldo Leopold	South Diamond Creek
Gila	Apache Creek
Gila	Black Canyon Creek
Gila	Brush Canyon
Gila	Canyon Creek
Gila	Chicken Coop Canyon

WILDERNESS	WATER NAME
Gila	Clear Creek
Gila	Cooper Canyon
Gila	Cow Creek
Gila	Cub Creek
Gila	Diamond Creek
Gila	East Fork Gila River
Gila	Gila River
Gila	Gilita Creek
Gila	Indian Creek
Gila	Iron Creek
Gila	Langstroth Canyon
Gila	Lilley Canyon
Gila	Little Creek
Gila	Little Turkey Creek

WILDERNESS	WATER NAME
Gila	Lookout Canyon
Gila	McKenna Creek
Gila	Middle Fork Gila River
Gila	Miller Spring Canyon
Gila	Mogollon Creek
Gila	Panther Canyon
Gila	Prior Creek
Gila	Rain Creek
Gila	Raw Meat Creek
Gila	Rocky Canyon
Gila	Sacaton Creek
Gila	Sapillo Creek
Gila	Sheep Corral Canyon
Gila	Skeleton Canyon

WILDERNESS	WATER NAME
Gila	Squaw Creek
Gila	Sycamore Canyon
Gila	Trail Canyon
Gila	Trail Creek
Gila	Trout Creek
Gila	Turkey Creek
Gila	Turkey Feather Creek
Gila	Turnbo Canyon
Gila	West Fork Gila River
Gila	West Fork Mogollon Creek
Gila	White Creek
Gila	Willow Creek
Gila	Woodrow Canyon

There are similar lists of Outstanding Natural Resource Waters in the Mimbres Basin and the Rio Grande Basin.

These waters are essential to one of the largest and most diverse assemblages of native flora and fauna in New Mexico. There are many vulnerable species in the area of Lobos MOA, and all of them deserve consideration for protection. Below is a graph that suggests the number of species in question from *Ecological & Biological Diversity of the Gila National Forest*, in *Ecological and Biological Diversity of National Forests in Region 3* by Bruce Vander Lee, Ruth Smith, and Joanna Bate, published by The Nature Conservancy. It is available at: https://www.fs.usda.gov/detail/r3/landmanagement/planning/?cid=fsbdev3_022067

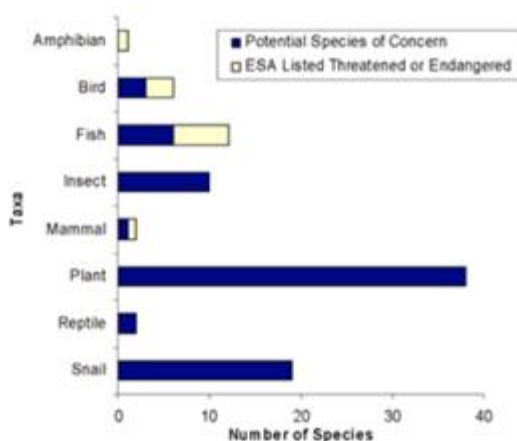


Figure 11-4. The number of potential species-of-concern (in blue) and federally listed endangered and threatened species (in yellow) by taxon that currently inhabit the Gila National Forest. Potential species-of-concern include species with NatureServe global ranks (G/T-rank) of three or less, species that are listed as candidate or proposed under the Federal Endangered Species Act (ESA), have been recently delisted under ESA, or species which have been petitioned for listing under ESA and for which a positive '90 day finding' has been made.

https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5300090.pdf

The same site has an extended discussion of which species are appropriate to a list of species-of-concern in the Gila National Forest.

The potential effects of chaff on each species and the life history of each species now needs to be analyzed, assessed, and mitigation measures or avoidance measures prescribed.

On the topics of water and wildlife, the GAO report also observed that: “The 1997 Air Force study and its technical reports also cite the need for data and further research, including long-term studies. Two of the three technical reports recommend further research. One suggests long-term studies to monitor chaff accumulation on water bodies in high-use areas and the effects on animals using those water bodies. Another states that consideration could be given to monitoring programs for highly sensitive environments subjected to repeated chaff releases and conducting bioassay tests to further assess the toxicity of chaff to aquatic organisms.”

- **Wilderness and Other Pristine Areas** - The 1997 Air Force report expressly states in the Executive Summary that: “Use of chaff over or immediately adjacent to highly sensitive areas such as Wilderness Areas, Wild and Scenic Rivers, National Parks and Monuments, and other pristine natural areas may be incompatible with the land use management objectives for those areas.”

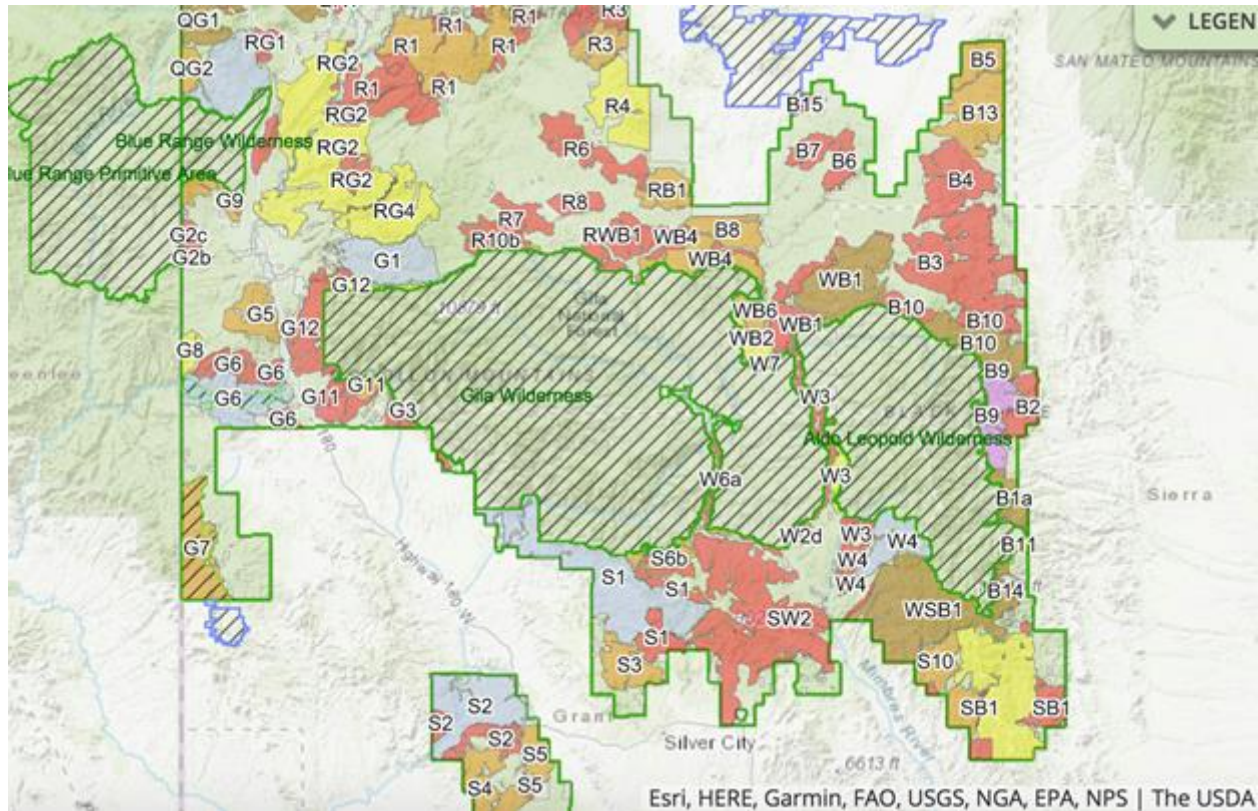
Later, on the topic of regulatory considerations, the report observes that:

“On surface uses, the Wilderness Act specifies that ‘wilderness areas shall be devoted to the public purpose of recreational, scenic, scientific, educational, conservation, and historical use’ (16 USC 1131[c]). Dropping chaff is not one of the listed uses.”

Wilderness is a signature attribute of the Gila area. The Gila Wilderness was this nation’s first wilderness, and the surrounding area is one of the largest aggregation of wild and pristine lands remaining in New Mexico -- and certainly the most diverse. The detritus of aluminized fiberglass from 10,000 annual sorties of F-16s combat training is incompatible with the untrammled natural values that wilderness represents. The uncertainty about potential adverse effects to the waters and wildlife of the wilderness compounds the inappropriateness of the Lobos MOA and the expansion of Cato/Smitty MOAs.



Even as planning for the Lobos MOA and the expansion of Cato/Smitty MOAs continues, new Wilderness Study Areas are being proposed in the Gila Area. Below is a recent map of the new proposals. Established Wilderness Areas and established Wilderness Study Areas are denoted with cross-hatching. The colored sections with letters and numbers represent the new proposals.



Gila National Forest Plan revision website

<https://usfs.maps.arcgis.com/apps/MapSeries/index.html?appid=7319b99c8ace4a19b650fda9a6aa4920>

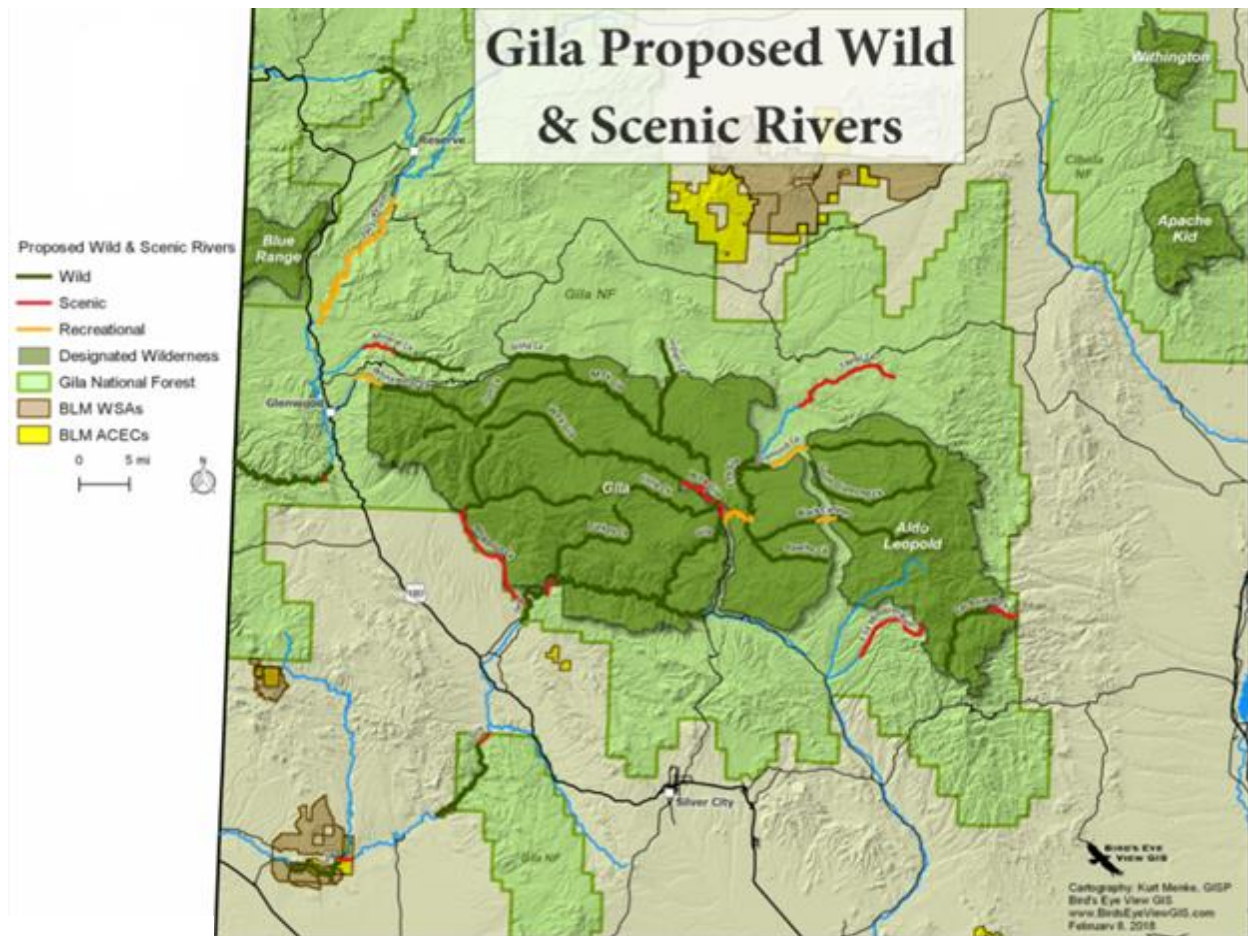
Currently, the Gila National Forest Service is reviewing the proposals as part of the Forest Plan Revision, which is now underway. For information consult: Gila National Forest Plan Revision. *DRAFT Evaluation Report of Lands Inventoried for Potential Wilderness Characteristic*. DRAFT Report, June 2018

https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd584786.pdf

Not all of these proposals will be designated as suitable for wilderness status, but nearly 500,000 acres have already received high to outstanding ratings by the forest planners.

Adding to the local Wilderness character, there is a proposal for *Wild and Scenic River* designation for waters in the Gila National Forest that has been submitted to the Gila National Forest Plan Revision process. See map below.

Note the tan and yellow areas that represent Wilderness Study Areas and Areas of Critical Environmental Concern administered by the Bureau of Land Management—yet another Wilderness advocate and manager.



<http://nmwildlife.org/wp-content/uploads/2018/09/Gila-WS-Proposal-Map-1024x796.png>

The Gila area is a special place endowed with high natural values. These values should not be squandered. Let the F-16 training be done on designated MOAs and restricted airspaces that already exist. Holloman AFB currently limits chaff use to restricted airspace. It should not change that practice here.

III. Potential for Inhalation of the Chaff Fibers

Chaff Inhalation - The 1999 panel report *Environmental Effects of RF Chaff* raised the issues of chaff degradation into smaller inhalable particles during its discharge, as well as on the ground as it weathers over time, and the possible re-suspension of those particles in the air again, animated perhaps by wind.

Will this be a problem in the Lobos and Cato/Smitty MOA? It is hard to say. **Does it feel windy today?** Referring back to section I of this paper, Drift of Chaff, it is easy to see why this may be a concern over the Gila since chaff does not stay stationary, but drifts with the wind.

Postscript - Chaff has a secondary impact: NOISE

“Fighter aircraft flight profiles are more diverse in vertical movement than bomber profiles due to their low-altitude, air-to-ground and higher-altitude air-to-air roles. Fighter-type aircraft may ingress to a low level target at 200 to 300 feet above ground level (AGL) and 480 to 600 knots to establish their climb angle, climb to 4,000 to 4,500 feet AGL, release their weapon, execute a hard turn while descending to 200 to 300 feet AGL, with multiple hard turns to exit the target area. Chaff will probably be released as the initial climb is established, just prior to weapon release, post weapon release, and as the hard turns are executed. Ingress to a target area may require a “combat descent” to the target or to a lower approach altitude. Depending on the defensive capabilities of the target area, chaff and/or flares may be used in the descent. Aircraft dependent, the descent may be accomplished at 30 to 60 degrees or near vertical angle at airspeeds ranging from 500 to 600 knots to supersonic speeds.”



www.thechive.com

<https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/PB98110620.xhtml>

Conclusion: It is likely that use of chaff will be associated with very noisy training activities. An F-16 at full military power will inflict 110dB(A)+ on the silent canyons of the Gila.