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SPOTLIGHT

Methamphetamine in Afghanistan: assessing changes to participation and production

Gain a geospatial perspective on real-world problems.

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DISCOVERY OF AN ABUNDANT AND INEXPENSIVE DRUG PRECURSOR

Afghanistan has a narcotics problem. Not only are citizens suffering high rates of addiction to drugs like opium, hashish, and heroin, but many communities depend on income from narcotics production. For nearly two decades, the government of Afghanistan and the International Security Assistance Force (ISAF) have worked to sever the country's economic dependence on poppy cultivation and other elements of the drug trade. Unfortunately, rising addiction rates in Afghanistan and abroad, unabated demand for Afghani heroin, and the lack of alternative income sources within the country continue to foil these efforts.

The introduction of crystal methamphetamine from Iran has only served to make matters worse. Known locally as shiseh, Iranian meth has amplified Afghanistan's narcotics woes since its introduction in the early 2010s. Though local residents have pioneered and continue to drive the production of methamphetamine in Afghanistan, criminal syndicates and insurgent groups like the Taliban have managed to capitalize on this growing trend through taxation among the population groups they control or influence. The consumption of crystal methamphetamine has supplanted heroin in some parts of Afghanistan, especially in urban areas, and the outlook for curbing this trend is bleak.

But the most significant recent development in the Afghan drug trade is a simple ingredient change. A 2019 investigation by Dr. David Mansfield and the GIS organization Alcis shows how the naturally occurring ephedra plant (referred to locally as the 'oman bush') has been integrated into Afghanistan's meth production process. Continuing efforts by Dr. Mansfield and his on-the-ground team uncovered the extent to which the ephedra plant has replaced expensive decongestant medicine as the source of ephedrine, a meth precursor. In addition to cutting production costs in half, this shift has had the unfortunate effect of increasing the number of Afghans involved in the process. Inhabitants of mountain communities have taken to climbing the rocky slopes to harvest the native plant in bushels, which are moved to lab owners via intermediary traders. For many Afghans in the central highlands, the ephedra harvest has become a much-needed source of reliable income.

This issue of Maxar Spotlight examines the relationship between communities and ephedra plant harvesting, as well as the propagation of methamphetamine labs in Afghanistan. Maxar Technologies advanced geospatial capabilities and unique subject matter expertise were used in several key locations to identify trends and suggest possible ways to detect and quantify meth production. This edition was produced in collaboration with Dr. David Mansfield and Alcis, whose field work in Afghanistan has given them valuable insight into the rapidly evolving situation on the ground.

SUMMARY OF UNIQUE TOOLS & APPLICATIONS

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Multispectral High-Resolution Satellite Imagery
Monitoring change at scale can be difficult, especially in restricted areas and conflict zones. Maxar satellite imagery offers the highest commercially available resolution, spectral diversity, and geolocation accuracy. For this study, our analysts leveraged sophisticated Maxar earth imaging and remote sensing capabilities to locate areas in central Afghanistan where ephedra was most likely recently harvested.

Geospatial Human Imagery Verification Effort (GeoHIVE)
GeoHIVE is our satellite imagery crowdsourcing team, comprised of geospatial analysts, developers, and imagery analysts who interact with a vetted crowd of online users to validate, discover, and annotate features of interest. For this study, GeoHIVE was used to identify newly constructed methamphetamine labs in Bakwa District, Farah Province, Afghanistan.

WHAT IS THE EPHEDRA PLANT?

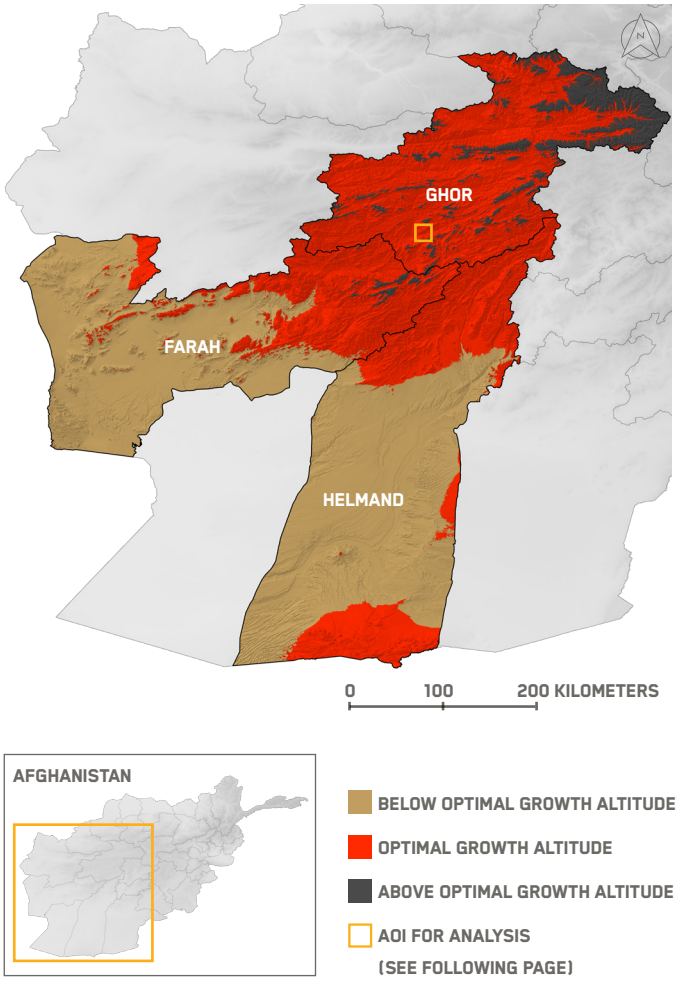
The ephedra plant is a flowerless perennial with a long history of cultivation and use by humans. It is a key source of the ephedrine used in traditional Chinese medicinal practices, and has been commonly used to treat asthma and other respiratory ailments. Until just a few years ago, Afghans considered the plant to have little value beyond its use as kindling, feed for livestock or use as a traditional medicine. Abundant in Afghanistan's rocky high-altitude slopes, it is so common in these mountains that there is no need to actively cultivate. Ephedra must simply be harvested between the months of August and October before the plant goes dormant for winter.

EPHEDRA PLANT - E. STROBILACEA (ALI PARSAEIMEHR/RESEARCHGATE)

Three sub-species of the ephedra plant can be found in Farah, Ghor, and Helmand provinces: e. strobilacea, e. major (procera), and e. sarcocarpa. These sub-species all grow at altitudes between 700 and 3,000 meters. According to Dr. Mansfield, there is no evidence the ephedra harvested at lower altitudes is being used for meth—rather, it is the plant taken at elevations above 2,500 meters that is harvested. For isolated mountain communities, the plant is rather accessible for anyone willing to scale the rocky slopes that surround their homes. There are no technical limitations to harvesting ephedra—all one needs is a sickle to cut the plant from the ground and a sack to transport the day's work back down mountain to sale to awaiting traders. The map to the right uses a digital elevation model (DEM) to show the areas in Farah, Ghor, and Helmand at the optimal altitude for the ephedra plant.

Historically, it was common for small, isolated communities to collectively produce their own batches of methamphetamine. Individuals would take on distinct roles in the process, such as acquiring the necessary precursor chemicals, transporting the final product, managing chemical waste, or actually doing the "cooking." Since the discovery that the alkaloid content of certain ephedra plant species can be isolated and extracted for use as a base for meth, several communities can now potentially contribute to the output of a single lab. In a country where the economy has historically been based on the cultivation of poppy, it is no surprise that Afghans are so eagerly taking to the rocky mountain slopes to harvest the plant with general indifference for its intended use and any lasting harmful repercussions.

IDEAL EPHEDRA CULTIVATION AREAS

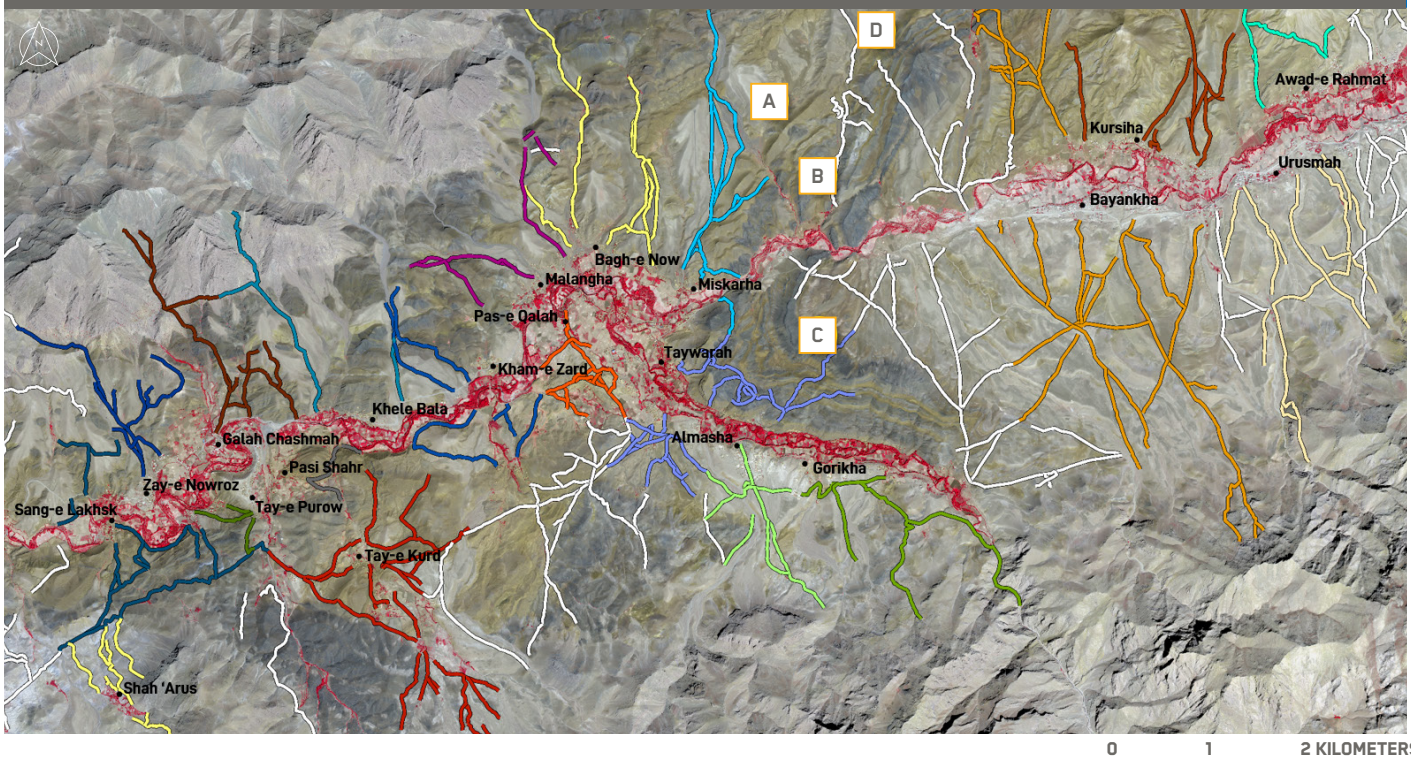


UNDERSTANDING COMMUNITY EPHEDRA HARVESTING

Sophisticated remote sensing techniques and imagery analysis are incredibly useful tools for both sociocultural and agricultural analysis. They can be used to determine the overall agricultural health of an area, as well as to identify and gauge changes in land cover like tree canopy loss from urban development and drought impacts. For this study, a blend of remote sensing techniques was used for two different analyses: to identify specific mountainsides whose physical characteristics suggest that community-based ephedra harvesting was likely, and to determine the feasibility of using remote sensing to actively detect the removal of the plant.

Determining harvest zones based on physical appearance was relatively straightforward. The image below depicts all possible community tracks and footpaths in an area of interest in southern Ghor Province. Each track is attributed to the village most likely claiming rights to that specific terrain or mountainside. (Note that tracks can also be used for grazing and other non-ephedra purposes.) The subsequent network provides insight on how these communities interact and where future land disputes might occur. This is especially important if current ephedra harvest trends continue and mountainside communities seek out new areas.

COMMUNITY FOOTPATHS AND TRACKS, SOUTHERN GHOR PROVINCE | SEPTEMBER 23, 2019 | WORLDVIEW-2 (FALSE COLOR)



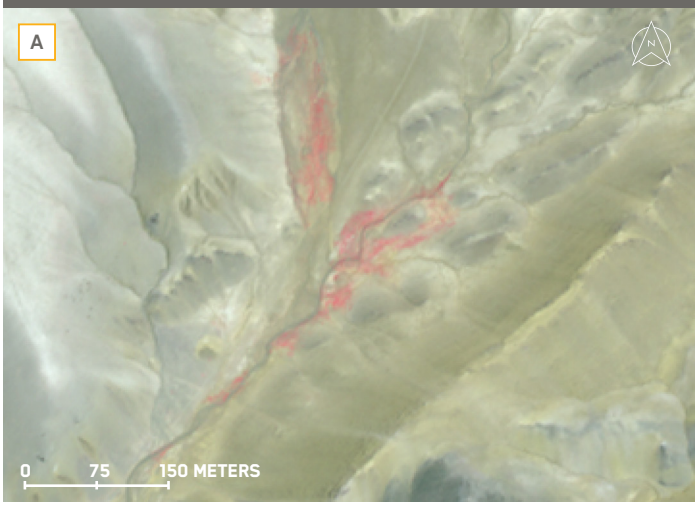
TRACKS/FOOTPATHS AND ASSOCIATED COMMUNITY

- ALMASHA
- AWLAD-E RAHMAT BEG
- BAGH-E NOW
- BAYANKHA
- GALAH CHASHMAH
- GORIKHA
- KHAM-E ZARD
- KHELE BALA
- KURSIHA
- MALANGHA
- MISKARHA
- PAS-E QALAH
- PASI SHAHR
- SANG-E LAKHSH
- SHAH ARUS
- TAY-E KURD
- TAY-E PUROW
- TAYWARAH
- URUSMAH
- ZAY-E NOWREZ
- INDETERMINANT

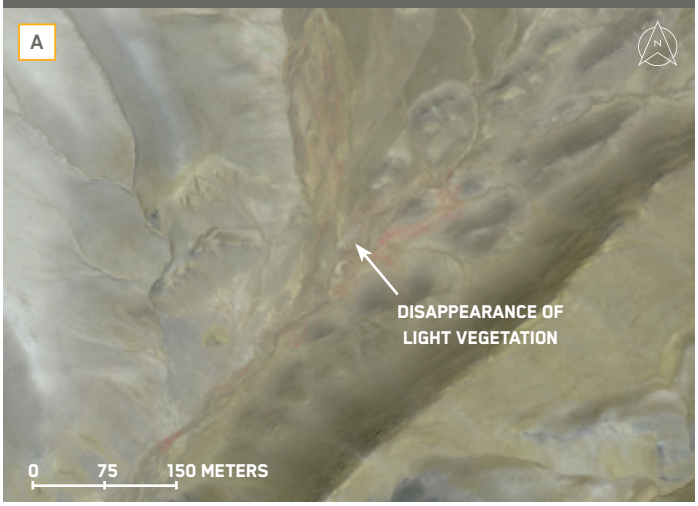
The second analysis proved to be somewhat more nuanced. Two high-resolution multispectral satellite images were compared to determine if ephedra plant removal could be detected. The first is a pre-harvest image from July 23, 2018, and the second from the harvest season itself on September 9, 2019. The spectral band combination chosen here uses the near-infrared-1, red, and green bands instead of the traditional natural color band combination (red, green, blue). This infrared false-color composite band combination relies upon the reflective properties of vegetation to create an image in which that vegetation appears as red. Accompanying each false-color composite is the Soil Adjusted Vegetation Index (SAVI), an analytical technique that uses a background adjustment factor to account for sparse vegetation and a large amount of soil visible in the imagery.

While it is easy to distinguish formal cropland vegetation and trees through the false-color composite and SAVI images, the bland physical characteristics and low profile of the ephedra plant make it challenging to identify. Areas that have an observed transformation of light vegetation over time can be observed and measured, but it is nearly impossible to distinguish the ephedra plant from other bushes and small plants that dominate Afghanistan's rocky mountain terrain. Additional investigation into the physical properties of the various ephedra plant species (including ground truth to confirm its presence or absence) would be necessary to understand the effectiveness of this approach.

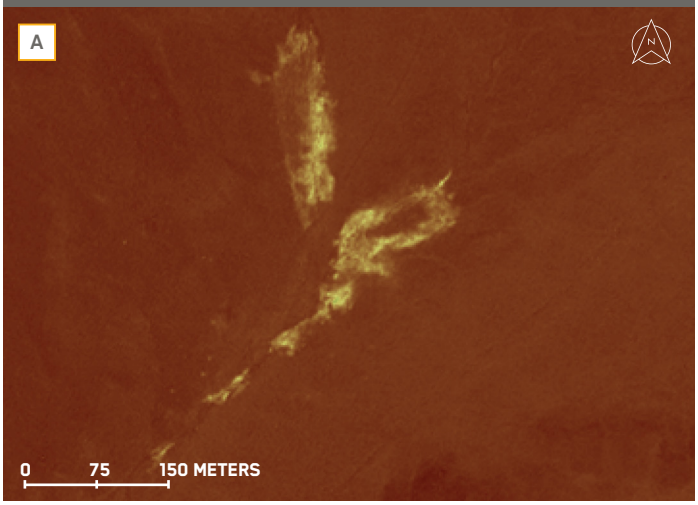
JULY 23, 2018 | WORLDVIEW-2 (FALSE COLOR)



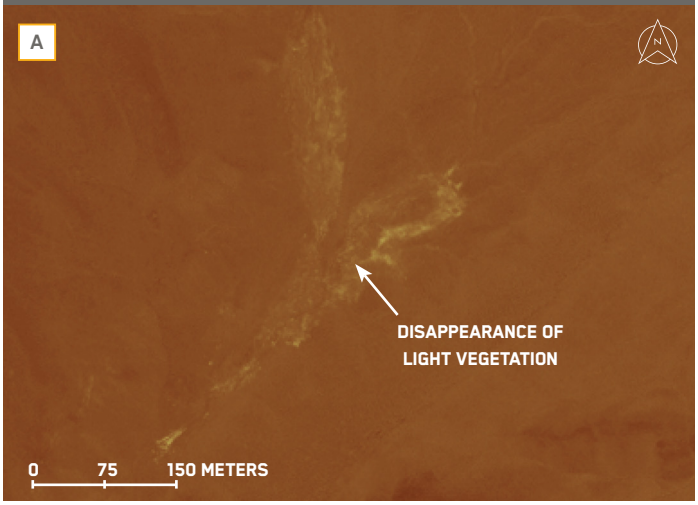
SEPTEMBER 23, 2019 | WORLDVIEW-3 (FALSE COLOR)



JULY 23, 2018 | WORLDVIEW-2 (SAVI)



SEPTEMBER 23, 2019 | WORLDVIEW-3 (SAVI)



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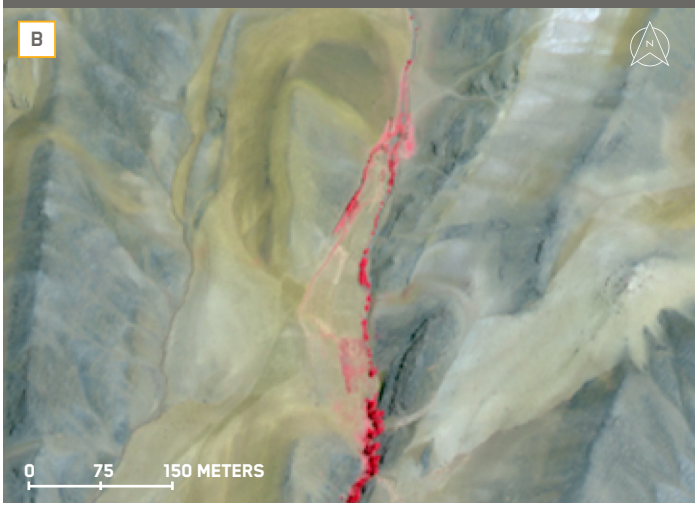

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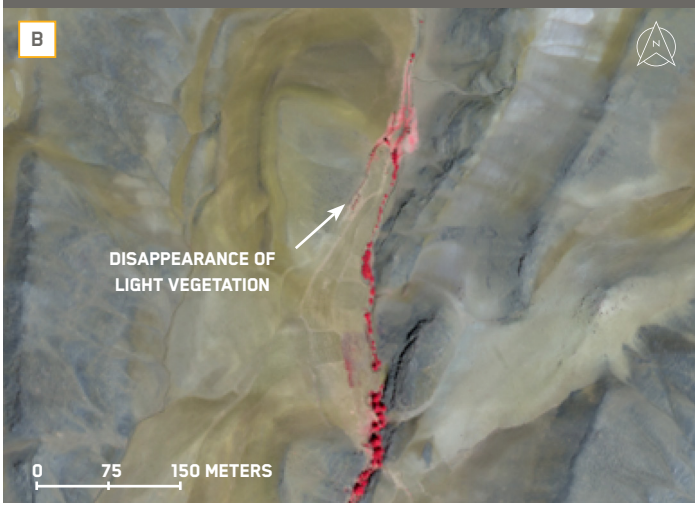

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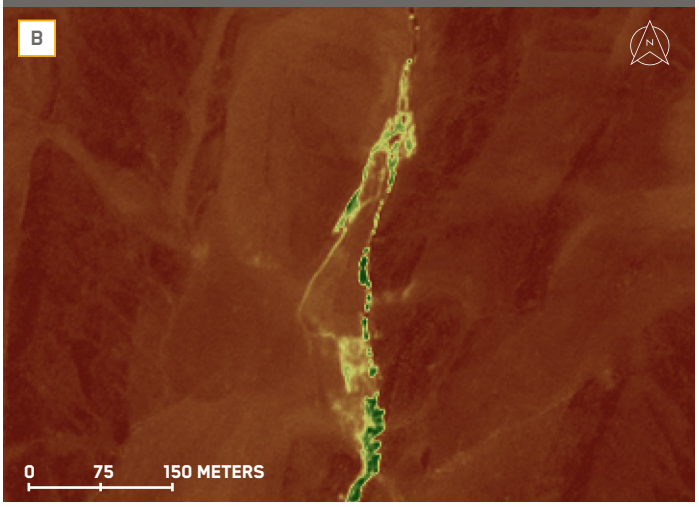
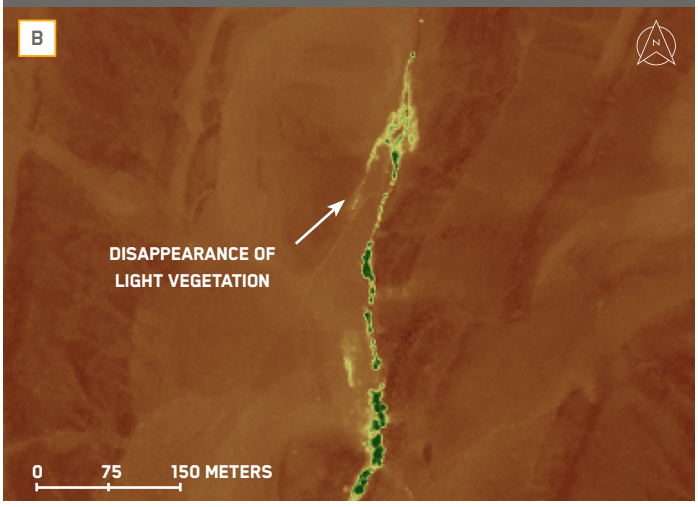
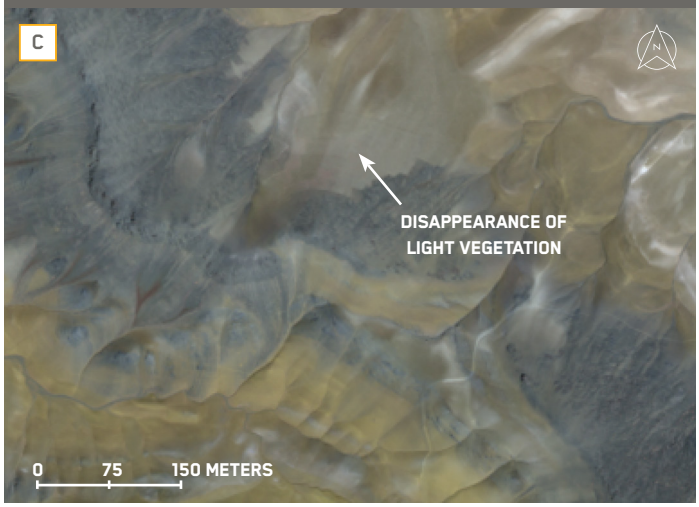


SEPTEMBER 23, 2019 | WORLDVIEW-3 (SAVI)

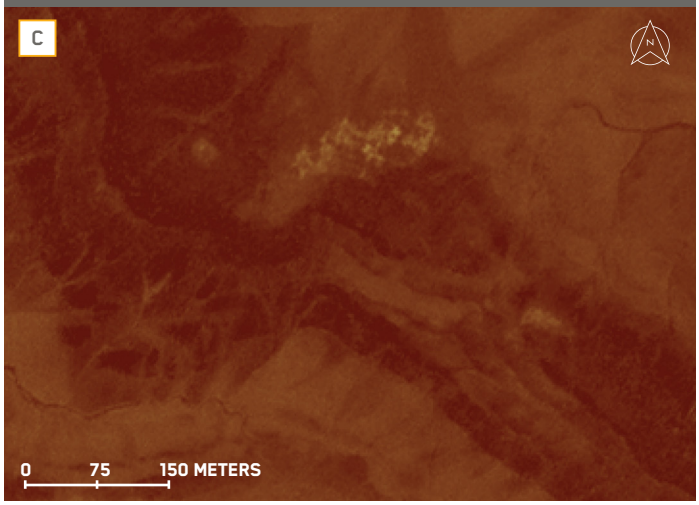


JULY 23, 2018 | WORLDVIEW-2 (FALSE COLOR)

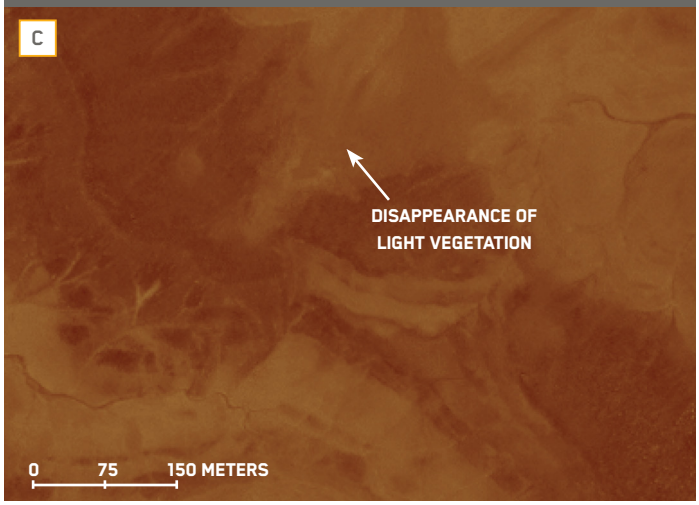
SEPTEMBER 23, 2019 | WORLDVIEW-3 (FALSE COLOR)



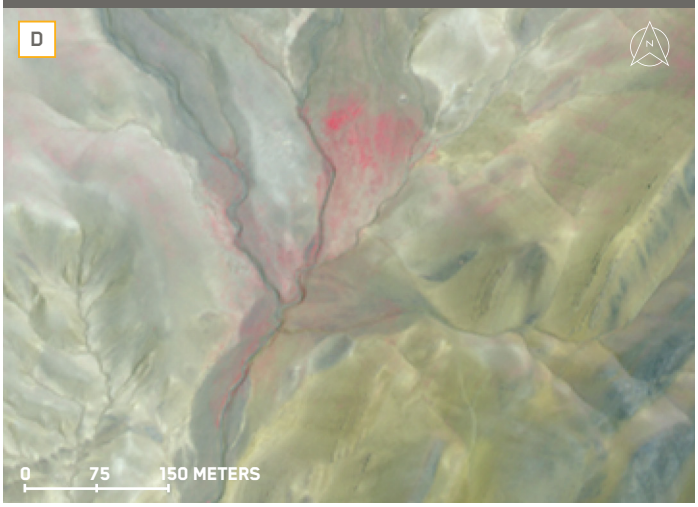
JULY 23, 2018 | WV-2 (SAVI CALCULATION)



SEPTEMBER 23, 2019 | WORLDVIEW-3 (SAVI)



JULY 23, 2018 | WORLDVIEW-2 (SAVI)



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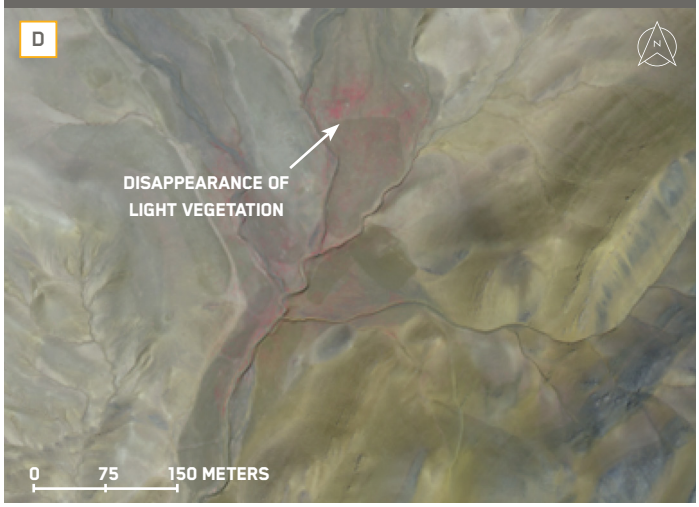

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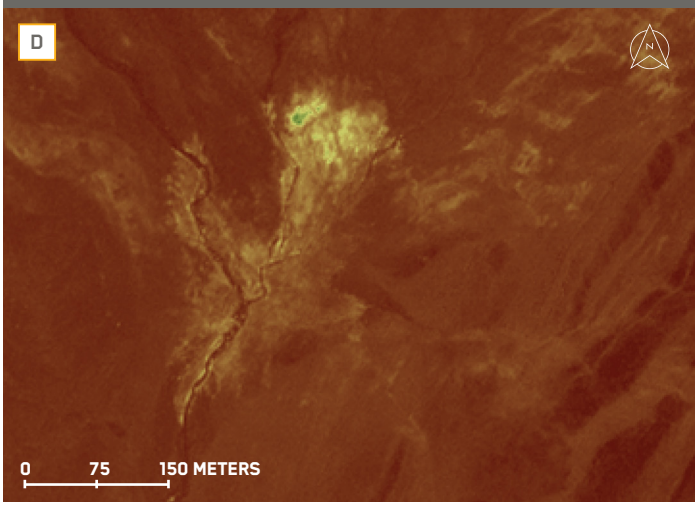
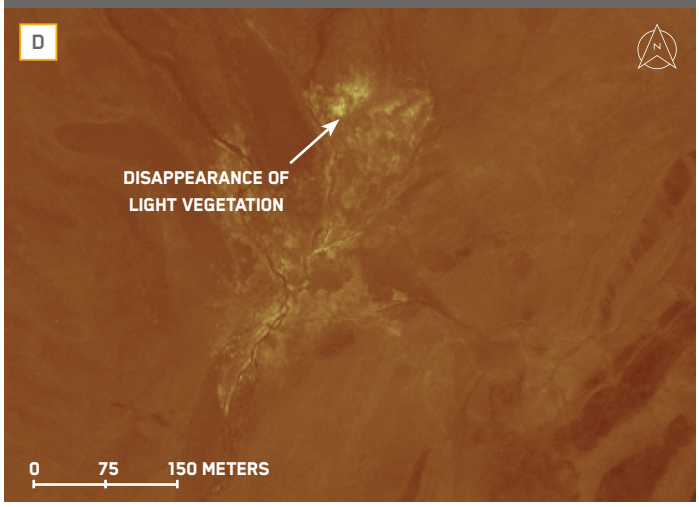


SEPTEMBER 23, 2019 | WORLDVIEW-3 (SAVI)



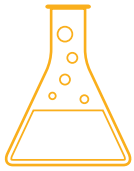
DETECTING ACTIVE METHAMPHETAMINE LABS IN AFGHANISTAN

Soon after Iranian shiseh methamphetamine first made its way into the consumer markets of Afghanistan about a decade ago, Iranian authorities cracked down heavily on narcotics production and trafficking. These aggressive counter-narcotics actions resulted in a shift of meth production from Iran into western Afghanistan, particularly to the border areas where it was easier to access imported pharmaceuticals containing pseudoephedrine, such as decongestants. The resulting boom in Afghan meth caught many by surprise. In an alarmingly short period of time, drug rehabilitation centers across the country were reporting that the majority of the persons treated were addicted to meth instead of heroin. Since then, Afghanistan has become a major producer of meth intended for domestic consumption—and, ironically, for export to Iran.

(AFGHAN ADDICTS SMOKE HEROIN AND METH (BEHROUZ MEHRI/AFP

According to United Nations data, methamphetamine seizures in Afghanistan increased by more than 600% between 2018 and 2019. Methamphetamine production in Afghanistan has been fueled by the ingredient change from expensive over-the-counter medicines containing pseudoephedrine to locally harvested ephedra. The increased demand for the drug and ease of production has led to a massive propagation of meth labs across the country. Interestingly, before the crackdown on drug activity in Iran, many Afghans who lived in Iran worked in meth labs due to the lack of economic prospects for migrants. The knowledge and expertise they acquired in Iran has now become useful back home.

GeoHIVE was used to identify and map probable meth lab locations in Bakwa District, Farah Province. The GeoHIVE campaign and subsequent analysis yielded 36 suspected meth labs in Bakwa District. The key indicator that the crowd was instructed to look for in each image chip was an effluent or runoff pool connected to a nearby roofed structure by a ditch or other linear feature. In developed countries where methamphetamine labs are a problem, chemical waste produced during the process can be disposed into household drains and the sewer system without an obvious trace. In Afghanistan, however, the lack of running water and sewers in most of the country means that meth labs frequently need to dispose of chemical waste in nearby outdoor pools. These disposal pools are often detectable in satellite imagery.



1 KILOGRAM

of methamphetamine

will produce

6 KILOGRAMS

of toxic chemical waste

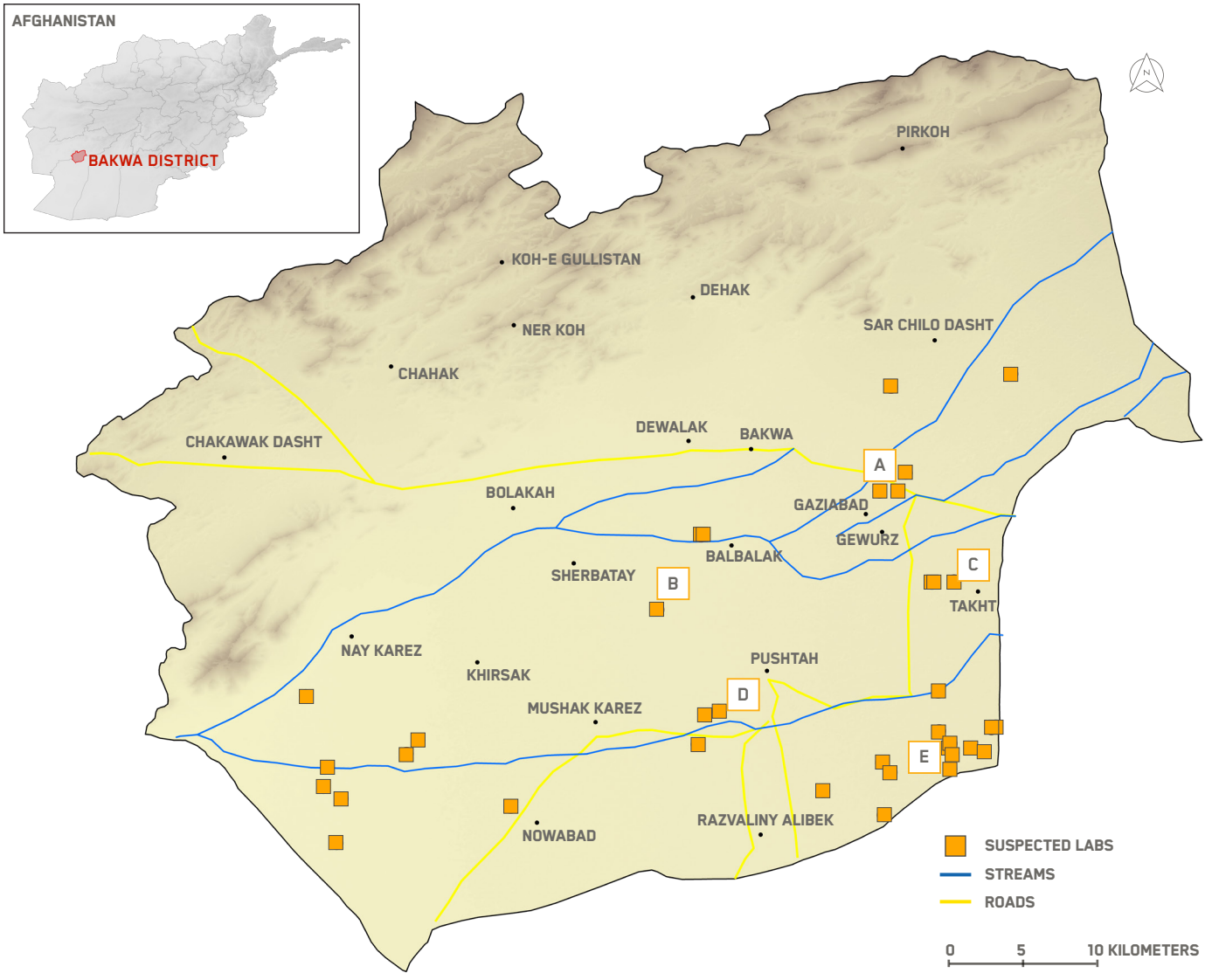
Beyond the mere presence of effluent pools, additional criteria were used to ensure the highest probability that the identified features were indeed methamphetamine labs. These criteria included:

- The pool was added to a pre-existing structure within the last year and appeared to be in use.
- The pool was not a ditch related to agricultural production or drainage.
- The pool was not connected to or near a small single-person structure like a lavatory.

The suspected meth labs identified by the GeoHIVE campaign revealed a striking diversity in the physical properties of the runoff pools, especially concerning size, shape, and proximity to the suspected lab structure. The before and after satellite images of five separate labs (depicted on the following two pages) illustrate such variations. An unintended takeaway from scrutinizing the physical characteristics of each suspected runoff pool is that the size of each pool could provide a good indication as to how much methamphetamine any single lab may be producing relative to others in the area.

It is also interesting to note the geographical distribution of the suspected labs throughout the district. The labs cluster in areas of the district that have a greater density of residential compounds. They are also in close proximity to the Abdul Wadood bazaar, which is the epicenter of the meth trade in this region. According to Dr. Mansfield, the locations in the southern part of the district are also near preferred trafficking routes that cut through the desert towards Iran.

GEOHIVE-DETECTED PROBABLE NEWLY CONSTRUCTED METHAMPHETAMINE LABS IN BAKWA

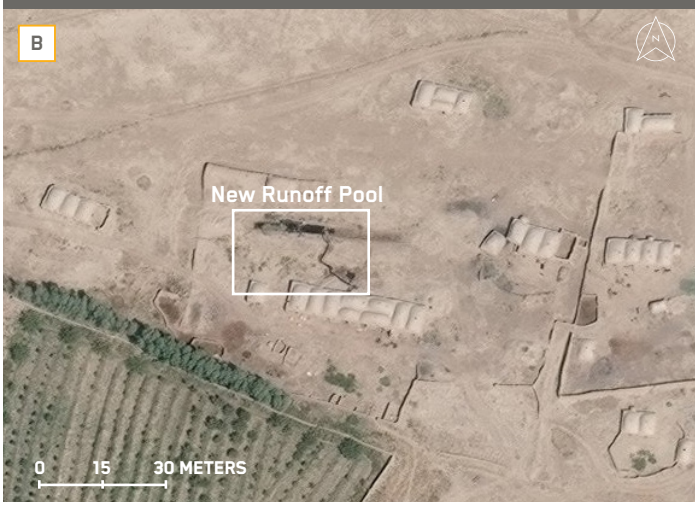


JUNE 17, 2018 | GEOEYE-1

AUGUST 10, 2019 | WORLDVIEW-3

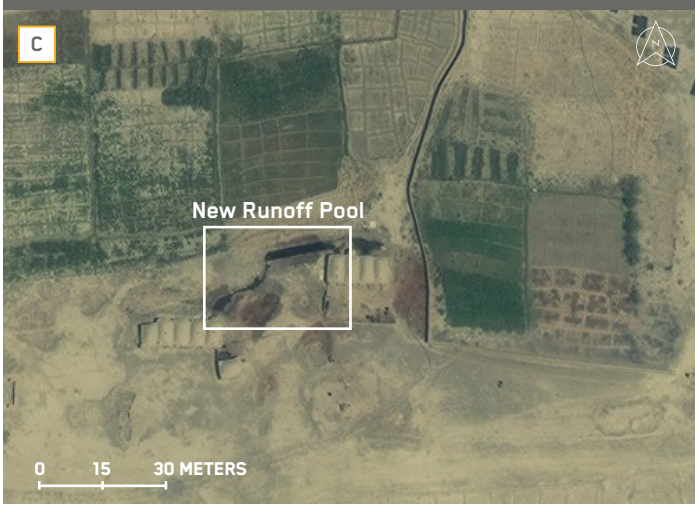
APRIL 10, 2017 | WORLDVIEW-3

SEPTEMBER 10, 2019 | WORLDVIEW-3



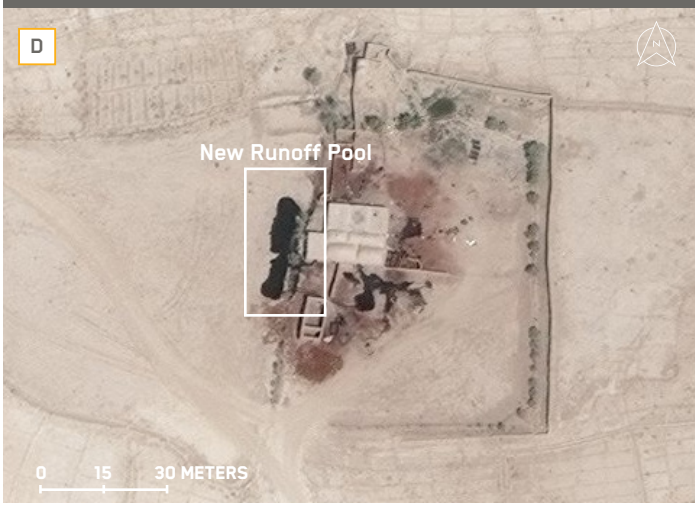
SEPTEMBER 30, 2018 | WORLDVIEW-3

AUGUST 16, 2019 | WORLDVIEW-3



APRIL 10, 2017 | WORLDVIEW-3

SEPTEMBER 10, 2019 | WORLDVIEW-3



JUNE 17, 2018 | GEOEYE-1

AUGUST 16, 2019 | WORLDVIEW-3

CONCLUSION

The explosion of methamphetamine production and use in Afghanistan has added yet another contributor to the country's seemingly unending instability.

It has been reported that the market for Afghan meth has slowed recently largely due to the economic downturn in Iran and renewed international sanctions, as well as American and Afghan airstrikes on labs. Nevertheless, meth production will not cease as long as legitimate economic alternatives for the average Afghan remain sparse.

In the meantime, Maxar high-resolution satellite imagery and GeoHIVE crowdsourcing capabilities can give local, national, and international authorities the insight they need to direct fieldwork and actions in response to Afghanistan's unabated drug problem.

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