2017 Users of Landsat Imagery Survey

Thank you for participating in this study of Landsat satellite imagery! This survey will take about 20 minutes to complete. To move through the survey, click only on the "Next" and "Back" buttons at the bottom of the page in the survey. To pause at any time, simply close the window and your answers will be saved. To resume and complete the survey, just click on the link to the survey in the email you received. At that point, you can answer any remaining questions and/or edit any of your previous responses. When you have answered all of the questions and are satisfied with your responses, click on the "Submit" button at the end of the survey.

SECTION 1: Use of Landsat Imagery

1. Have you used Landsat imagery in your work **in the past year**? *Please select only one answer.*
   ☐ Yes
   ☐ No➔*END*

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2. What percentage of your work used Landsat imagery **in the past year**? *Please write a number from 1 to 100 in the box below or check "Don't know".*

   Percentage
   ☐ Don't know

3. What other remotely sensed imagery do you use in your work?
   ☐ None, I only use Landsat.
   ☐ Low-resolution multispectral satellite imagery, such as MODIS
   ☐ Other moderate-resolution multispectral satellite imagery, such as Sentinel
   ☐ High-resolution multispectral satellite imagery, such as WorldView
   ☐ Airborne multispectral imagery
   ☐ Airborne photography
   ☐ LiDAR
   ☐ Radar
   ☐ Other (*please specify*)_____

4. Of your work that used Landsat imagery, what percentage was operational and non-operational?

> **Operational work** is defined as continuous or ongoing work that either relies on the consistent availability of Landsat imagery OR is mandated or required (e.g., crop reports, routine mapping, monitoring).
> **Non-operational work** is defined as one-time projects OR other work that is not mandated (e.g., most scientific research).
> *Please enter a number from 0 to 100 on each line. The total must equal 100.*

Operational	
Non-operational	
Total	**100%**

5. Approximately how many unique Landsat scenes did you use in your work **in the past year**?
Please enter a whole number in the box below or check "Don't know". If you used the same scene more than once, only count that scene one time. If you are unsure how many scenes you used, please provide your best estimate.

Number of scenes

☐ Don't know

6. As part of the free and open data policy, there are no restrictions on distributing Landsat imagery. Beyond using Landsat in your own work, did you distribute Landsat imagery or products to other users **in the past year**? *Please check only one.*
☐ Yes
☐ No → *Q11*

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7. What type of Landsat imagery or products did you distribute? *Please check all that apply.*
☐ Raw or minimally processed Landsat imagery (e.g., Level 0 uncalibrated raw data, Level 1 radiometrically calibrated and orthorectified data)
☐ Landsat products developed by USGS (e.g., Level 2 Surface Reflectance, Level 2 Land Surface Temperature, Level 3 Burned Area)
☐ Landsat products I developed myself

8. **In the past year**, approximately how many users did you distribute Landsat imagery or products to? *Please write a whole number in the box below or check "Don't know".*

Number of users

☐ Don't know

9. In which sectors did these users work? *Please check all that apply.*
    ☐ Academic institution as faculty, staff, or student (e.g., university, college, technical/vocational)
    ☐ International government (e.g., United Nations, European Union)
    ☐ National/Federal government
    ☐ State/Provincial/Departmental government
    ☐ Local government (for example, county, city)
    ☐ Tribe/Nation/Indigenous government
    ☐ Private business
    ☐ Non-profit organization
    ☐ Other (*please specify*) _____

10. **In the past year**, approximately how many Landsat scenes (processed into a product or not) did you distribute to these other users? *Please enter a whole number in the box below or check "Don't know". Count all scenes you distributed, even if you distributed the same scene multiple times. If you are unsure how many scenes you distributed, please provide your best estimate.*

Number of scenes

☐ Don't know

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11. What is the **primary** application for which you have used Landsat imagery in your work **in the past year**? *Please select only one. You will be able to select a secondary application in a subsequent question.*
    ☐ Agricultural forecasting
    ☐ Agricultural management/production/conservation
    ☐ Biodiversity conservation
    ☐ Climate science/change
    ☐ Coastal science/monitoring/management
    ☐ Cryospheric science (for example, sea ice, ice caps, glaciers, permafrost)
    ☐ Ecological/ecosystem science/monitoring
    ☐ Fish and wildlife science/management

- ☐ Fire science/management
- ☐ Forest science/management
- ☐ Geology/volcanology
- ☐ Land use/land cover change
- ☐ Range/grassland science/management
- ☐ Recreation science/management
- ☐ Water resources (for example, watershed management, water rights, hydrology)
- ☐ Energy (for example, oil, natural gas, coal)/metals/minerals exploration/extraction/development
- ☐ Alternative energy exploration/development (e.g., wind, solar, geothermal)
- ☐ Rural planning and development (for example, zoning, economic development, land use)
- ☐ Urban planning and development (for example, zoning, economic development, land use)
- ☐ Urbanization (for example, growth, sprawl)
- ☐ Engineering/construction/surveying
- ☐ Assessments and taxation
- ☐ Real estate/property management
- ☐ Art/media
- ☐ Cultural resource management/anthropology/archaeology
- ☐ Software development
- ☐ Telecommunications
- ☐ Transportation
- ☐ Utilities
- ☐ Education: K-12
- ☐ Education: university/college
- ☐ Technical training (for example, workshops, short courses)
- ☐ Emergency/disaster management
- ☐ Hazard insurance (for example, crop, flood, fire)
- ☐ Humanitarian aid
- ☐ Public health
- ☐ Defense/national security
- ☐ Environmental regulation
- ☐ Law enforcement
- ☐ Other application (*please specify*) _____

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12. Which one of these environmental parameters have you derived most often from Landsat imagery for your ***primary*** application **in the past year**? *Please select only one.*
- ☐ Crop stage/crop yield

- ☐ Crop type
- ☐ Non-photosynthetic vegetation
- ☐ Active fires
- ☐ Burned area extent/severity
- ☐ Land cover/land use/vegetation type
- ☐ Canopy cover/biomass
- ☐ Vegetation index/phenology/leaf area index
- ☐ Vegetation condition/stress/vigor/disturbance
- ☐ Vegetation height/structure
- ☐ Land skin temperature
- ☐ Land surface elements/infrastructure (natural and man-made elements)
- ☐ Surface reflectance/albedo
- ☐ Bathymetry
- ☐ Lake/river water temperature
- ☐ Surface water extent
- ☐ Water quality/water chemistry
- ☐ Glacier/ice sheet extent
- ☐ Lake/river ice extent
- ☐ Snow cover extent
- ☐ Other parameter (*please specify*) _____

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13. In addition to the primary application, in what main secondary area have you used Landsat imagery in your work **in the past year**? *Please select only one.*

- ☐ **I have not used it in another area.**→*Q14*
- ☐ Agricultural forecasting
- ☐ Agricultural management/production/conservation
- ☐ Biodiversity conservation
- ☐ Climate science/change
- ☐ Coastal science/monitoring/management
- ☐ Cryospheric science (e.g., sea ice, ice caps, glaciers, permafrost)
- ☐ Ecological/ecosystem science/monitoring
- ☐ Fish and wildlife science/management
- ☐ Fire science/management
- ☐ Forest science/management
- ☐ Geology/volcanology
- ☐ Land use/land cover change

- ☐ Range/grassland science/management
- ☐ Recreation science/management
- ☐ Water resources (for example, watershed management, water rights, hydrology)
- ☐ Energy (for example, oil, natural gas, coal)/metals/minerals exploration/extraction/development
- ☐ Alternative energy exploration/development (for example, wind, solar, geothermal)
- ☐ Rural planning and development (for example, zoning, economic development, land use)
- ☐ Urban planning and development (for example, zoning, economic development, land use)
- ☐ Urbanization (for example, growth, sprawl)
- ☐ Engineering/construction/surveying
- ☐ Assessments and taxation
- ☐ Real estate/property management
- ☐ Art/media
- ☐ Cultural resource management/anthropology/archaeology
- ☐ Software development
- ☐ Telecommunications
- ☐ Transportation
- ☐ Utilities
- ☐ Education: K-12
- ☐ Education: university/college
- ☐ Technical training (for example, workshops, short courses)
- ☐ Emergency/disaster management
- ☐ Hazard insurance (for example, crop, flood, fire)
- ☐ Humanitarian aid
- ☐ Public health
- ☐ Defense/national security
- ☐ Environmental regulation
- ☐ Law enforcement
- ☐ Other application (*please specify*) _____

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14. Which one of these environmental parameters have you derived most often from Landsat imagery for your *secondary* application **in the past year**? *Please select only one.*

- ☐ Crop stage/crop yield
- ☐ Crop type
- ☐ Non-photosynthetic vegetation
- ☐ Active fires
- ☐ Burned area extent/severity

- ☐ Land cover/land use/vegetation type
- ☐ Canopy cover/biomass
- ☐ Vegetation index/phenology/leaf area index
- ☐ Vegetation condition/stress/vigor/disturbance
- ☐ Vegetation height/structure
- ☐ Land skin temperature
- ☐ Land surface elements/infrastructure (natural and man-made elements)
- ☐ Surface reflectance/albedo
- ☐ Bathymetry
- ☐ Lake/river water temperature
- ☐ Surface water extent
- ☐ Water quality/water chemistry
- ☐ Glacier/ice sheet extent
- ☐ Lake/river ice extent
- ☐ Snow cover extent
- ☐ Other parameter (please specify) _____

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SECTION 2: Landsat Features

15. What spatial resolution would result in a significant improvement in deriving the
environmental parameters for your primary application of Landsat imagery? *Please select
only one.*
- ☐ No significant improvement would occur with spatial resolution better than 30 meters. →
  Q17
- ☐ 20 meters
- ☐ 15 meters
- ☐ 10 meters
- ☐ 5 meters
- ☐ <5 meters

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16. What benefits would you expect to see if this improvement in spatial resolution occurred?
*Please consider scientific, management, economic, and social benefits. (Open-ended – limit
1500 characters)*

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17. In the past year, on average, how many days elapsed between obtaining **cloud-free**, usable
Landsat scenes to derive the environmental parameters for the most important project within

your primary application? *Depending on the area of the world their work is conducted, some people may have been able to obtain usable imagery every 8 days, while others may have only been able to obtain it every 32 days or longer. Please write a whole number in the box below.*

| | days

18. How often would you need **cloud-free**, usable Landsat imagery to result in a significant improvement in deriving the environmental parameters for the most important project within your primary application? *Please write a whole number in the box below or check "No significant improvement would occur if usable Landsat imagery were available more often."*

| | days

OR

☐ No significant improvement would occur if usable Landsat imagery were available more often.

If Q18 has a number, go to Q19. If Q18 has no number and box checked or does not have a response, go to Q20.

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19. What benefits would you expect to see if this improvement in the availability of usable Landsat imagery occurred? *Please consider scientific, management, economic, and social benefits. (Open-ended – limit 1500 characters)*

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20. In the past year, which of the current spectral bands of Landsat imagery have you used in deriving environmental parameters for your primary application? *Please check all that apply.*
☐ Band 1 – Ultra Blue (coastal/aerosol; 0.43 - 0.45 μm)
☐ Band 2 – Blue (0.45 - 0.51 μm)
☐ Band 3 – Green (0.53 - 0.59 μm)
☐ Band 4 – Red (0.64 - 0.67 μm)
☐ Band 5 – Near Infrared (NIR; 0.85 - 0.88 μm)
☐ Band 6 – Shortwave Infrared (SWIR; 11.57 - 1.65 μm)
☐ Band 7 – Shortwave Infrared (SWIR; 22.11 - 2.29 μm)
☐ Band 8 – Panchromatic (0.50 - 0.68 μm)
☐ Band 9 – Cirrus (1.36 - 1.38 μm)
☐ Band 10 – Thermal Infrared (TIRS; 110.60 - 11.19 μm)
☐ Band 11 – Thermal Infrared (TIRS; 211.50 - 12.51 μm)

21. What changes in or additions to the current spectral bands of Landsat imagery would result in a significant improvement in deriving the environmental parameters for your primary application? *Please consider changes to existing bands as well as new bands. Write your response in the box below OR check "No significant improvement would occur if the current spectral bands changed." (Open-ended – limit 1500 characters)*

       OR

☐   No significant improvement would occur if the current spectral bands changed.
If Q21 has a written response, go to Q22. If Q21 has no written response and box checked or does not have a response, go to Q23.

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22. What benefits would you expect to see if these changes in the spectral bands of Landsat imagery occurred? *Please consider scientific, management, economic, and social benefits. (Open-ended – limit 1500 characters)*

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23. The previous questions focused on the ideal features for imagery which best measures the environmental parameters within your primary application. However, in the real world, trade-offs between features have to be made when selecting imagery. With that in mind, we would like you to consider the four options below. The first option contains the features of Landsat 8 imagery, including the zero dollar price tag. The other three options represent potential imagery that you could purchase in the private market. These options have various improvements over Landsat 8 data, such as better spatial resolution or higher frequency of acquisition, but they also cost money. *While considering **your current project/organizational budget and the environmental parameters you need to derive for your primary application**, please rank these options from most preferred (represented by 1) to least preferred (represented by 4), using each number once.*

NOTE FOR REVIEWERS: This matrix and the one for Q24 will be different for each respondent. While the Landsat 8 column will remain the same, the three hypothetical imagery options will consist of different combinations of the attributes seen here. Cost will also vary. The responses to these questions will be analyzed using a stated choice approach which enable a comparison of the importance of each attribute in selecting imagery.

Features of the imagery	Landsat 8	Option A	Option B	Option C
Spatial resolution	30 meters	5 meters	10 meters	20 meters
Frequency of revisit (every [X] days – does not ensure a usable image at every revisit)	16 days	8 days	5 days	1 day
Spectral bands	Landsat 8 bands	Landsat 8 bands	Landsat 8 bands plus additional bands	Landsat 8 bands plus additional bands

Thermal band	Has two bands	Has one band	Has two bands	Has no thermal bands
Cost per image downloaded	$0	$X where $X>0	$Y where $Y>0	$Z where $Z>0
Rank the options from 1 to 4, with 1 being the most preferred and 4 being least preferred.	_____	_____	_____	_____

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24. If cost was not a consideration, which of these would be your preferred options? *While considering the environmental parameters you need to measure within your primary application, please rank these options from most preferred (represented by 1) to least preferred (represented by 4), using each number once.*

Features of the imagery	**Landsat 8**	**Option A**	**Option B**	**Option C**
Spatial resolution	30 meters	5 meters	10 meters	20 meters
Frequency of revisit (every [X] days – does not ensure a usable image at every revisit)	16 days	8 days	5 days	1 day
Spectral bands	Landsat 8 bands	Landsat 8 bands	Landsat 8 bands plus additional bands	Landsat 8 bands plus additional bands
Thermal band	Has two bands	Has one band	Has two bands	Has no thermal bands
Rank the options from 1 to 4, with 1 being the most preferred and 4 being least preferred.	_____	_____	_____	_____

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25. Ideally, how soon would you need Landsat imagery after it has been acquired? *Please check only one.*
- ☐ Same day/Near real time
- ☐ Within 2-3 days
- ☐ Within one week
- ☐ Within a month
- ☐ In the same season it was acquired
- ☐ In the same year it was acquired
- ☐ Does not matter

26. In the past year, what has been your primary source of the Landsat imagery you have used in your work? *Please check only one.*

☐ USGS portals such as Earth Explorer and GloVIS
☐ NASA Earthdata
☐ Google Earth Engine
☐ Amazon Web Services
☐ AmericaView
☐ University/college
☐ Other (*please specify*)_____

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27. How likely would you be to use the following imagery options if they were offered by
USGS? *Please select one option in each row.*

Landsat imagery options	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely
A subset of specific bands (e.g., downloading only red, green, and blue bands)	-2	-1	0	1	2
A portion of a scene (e.g., a crop or shapefile tool for selection of a specific area within a scene)	-2	-1	0	1	2
Analysis-ready data (e.g., tiled co-registered data cube ideal for time series analysis)	-2	-1	0	1	2

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28. How critical are (or will be, once developed) the following Landsat data products for your
work? *Please select one option in each row.*

Landsat data product	Not at all critical	Somewhat critical	Critical	Very critical	Cannot do my work without it
Level 0 (uncalibrated raw data)	0	1	2	3	4
Level 1 (radiometrically calibrated and orthorectified data)	0	1	2	3	4
Level 1 Web-enabled Landsat Data (WELD) composited mosaics	0	1	2	3	4
Level 2 Surface Reflectance	0	1	2	3	4
Level 2 Land Surface Temperature	0	1	2	3	4
Level 3 Burned Area (provisional)	0	1	2	3	4
Level 3 Dynamic Surface Water Extent (provisional)	0	1	2	3	4

Level 3 Fractional Snow Covered Area (provisional)	0	1	2	3	4
Level 3 Land cover and change product (in development)	0	1	2	3	4

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SECTION 3: Value of Landsat

29. In the event that Landsat imagery was no longer available, you may have to obtain imagery elsewhere. Assume that you are restricted to your current project or organization budget level and that the money to pay any cost for replacement imagery and additional software or training would have to come out of your existing budget. If you had to pay for imagery that was equivalent to currently available Landsat imagery, would you pay $*XXX* for one scene covering the area equivalent to a Landsat scene?

    ☐ Yes

    ☐ No → *Q34*

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30. How certain are you that you would pay $XXX for the imagery? *Please select the percentage that best represents your answer.*

    0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

    Not Certain   Very Certain
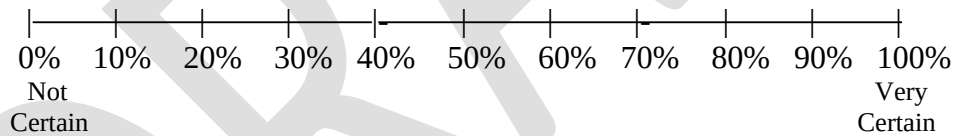
31. Approximately how many scenes would you buy **per year** if each scene cost $*XXX*? *Please write a whole number in the box below. (Open-ended – limit 10 characters)*

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32. If the cost was $*(1.25x bid amount in Q28)*, would you pay this amount for one scene covering the area equivalent to a Landsat scene?

    ☐ Yes

    ☐ No → *Q40*

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33. Approximately how many scenes would you buy **per year** if each scene cost $*(1.25x original)*? *Please write a whole number in the box below. (Open-ended – limit 10 characters)* → *Q40*

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34. How certain are you that you would not pay $XXX for the imagery? *Please select the percentage that best represents your answer.*

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not Certain										Very Certain

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35. If the cost was $(*0.75x bid amount in Q28),* would you pay this amount for one scene covering the area equivalent to a Landsat scene?
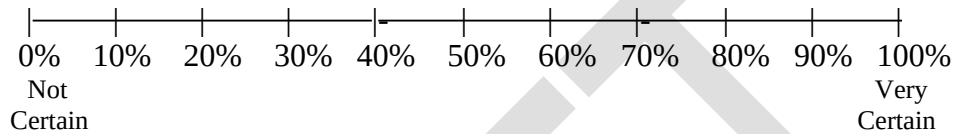   ☐ Yes
   ☐ No → *Q37*

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36. Approximately how many scenes would you buy **per year** if each scene cost $*(0.75x original)*? *Please write a whole number in the box below. (Open-ended – limit 10 characters)* → *Q40*

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37. If the cost was $1, would you pay this amount for one scene covering the area equivalent to a Landsat scene?
   ☐ Yes
   ☐ No → *Q39*

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38. Approximately how many scenes would you buy **per year** if each scene cost $1? *Please write a whole number in the box below. (Open-ended – limit 10 characters)* → *Q40*

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39. Why you would not pay $1 for the imagery? *Please check all that apply.*
   ☐ Landsat imagery is not worth that much money to me.

☐ My projects/organization cannot afford to pay that much for Landsat imagery.

☐ Even if I wanted to, I do not have a way to pay for the imagery (e.g., do not have a credit card or other electronic method of payment available).

☐ Landsat imagery should be provided free of charge since my tax dollars already paid for it.

☐ I would use other imagery available at no cost.

☐ Other (*please specify*)_____

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40. Satellite imagery such as Landsat can require significant preprocessing before beginning analyses, particularly time-series analyses that use data from different Landsat sensors. Analysis-ready data is built from imagery from multiple Landsat sensors which has been corrected to ensure spatial alignment and calibration consistency through time. Each pixel in a given tile occupies the same location as in the tiles collected before and after it, enabling time-series analyses. Each non-overlapping tile measures 5,000 by 5,000 pixels. If a stack of tiles of Landsat time series analysis-ready data, including the most current to the oldest, for a location relevant to your work, cost you $Y, would you choose to purchase this data? *Please take your current project/organization budget into account when deciding whether you would pay this amount.*

☐ Yes → *Q42*

☐ No

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41. Why would you not pay this amount for analysis-ready Landsat data? *Please check all that apply.*

☐ I do not conduct time series analyses with Landsat imagery.

☐ Analysis-ready data is not worth that much money to me.

☐ My projects/organization cannot afford to pay that much for analysis-ready data.

☐ Even if I wanted to, I do not have a way to pay for the imagery (e.g., do not have a credit card or other electronic method of payment available).

☐ Analysis-ready data should be provided free of charge like other Landsat products.

☐ Other (*please specify*)_____

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SECTION 4: Work experience

42. In what sector do you work? *Please select only one answer. If you work for more than one entity, select the sector in which you spend more of your time working.*

☐ Academic institution as faculty, staff, or student (e.g., university, college, technical/vocational) → *Q43 (all other responses → Q44)*

- ☐ International government (e.g., United Nations, European Union)
- ☐ National/Federal government
- ☐ State/Provincial/Departmental government
- ☐ Local government (for example, county, city)
- ☐ Tribe/Nation/Indigenous government
- ☐ Private business
- ☐ Non-profit organization
- ☐ Other (please specify) _____

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43. What is your current role at your academic institution?
- ☐ Faculty or staff (e.g., professor, researcher, postdoctoral researcher)
- ☐ Graduate student
- ☐ Undergraduate student

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44. How many years have you been using remotely sensed imagery? *Please write a whole number in the box below. If less than one year, just write 1.*

Years   ☐

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45. Thank you for completing this survey! The space below is provided for any additional comments you may have. Please click the Submit button when you are finished. *(Open-ended - limit 1500 characters)*