Users of Landsat Imagery

All respondents will receive the same introductory instructions which have been modified slightly to address a minor technical issue within the survey software as well as to change the estimated time to complete the survey. Throughout the survey, references to "moderate-resolution" imagery from the initial survey have been replaced with "Landsat" imagery. Additionally, headings, instructions, and questions have been simplified and/or shortened to reduce redundancy and ease the burden on the respondent. In some cases, the order of the questions has been changed to improve the flow. Changes to original questions, deletions of original questions, and additions of new questions are noted and justified.

Thank you for participating in this study of Landsat satellite imagery! This survey will take about 30 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 – DO NOT CLICK ON THE FORWARD OR BACK BROWSER BUTTONS**.** 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

The primary purpose of Section 1 is to find out what types of satellite imagery they are currently using, including Landsat, as well as how they use Landsat in their work.

Please tell us about your use of Landsat imagery.

The original Question 1 confirming use of moderate-resolution imagery was removed because the survey is asking specifically about Landsat imagery, rather than moderate-resolution imagery. The new Question 1 was modified to ask about Landsat imagery rather than moderate-resolution imagery. This question determines whether the user is a current user or not. Given that the EROS list includes users who may not have downloaded imagery in the past year and that the users identified in the snowball sampling may also not be current users, this question is necessary to distinguish between past and current users so they can be asked the questions most relevant to

them.

1. Have you used Landsat imagery **in the past year**? *Please select only one answer.*
   - ☐ Yes
   - ☐ No➔*Q66 (section for past Landsat users)*

Questions 2-4 will provide information on what type of imagery is fulfilling users' needs. Question 2 has been modified to include both low- and high-resolution imagery, instead of just moderate-resolution imagery, due to the fact that many respondents from the first survey were using a broader mix of imagery than just moderate-resolution imagery. Question 3 was added to better understand the dependency of users on the different types of Landsat imagery, in case Landsat 5 does not continue to operate and Landsat 7 imagery is the only type of Landsat imagery available until the new satellite launches. Question 4 was also added to understand what portions of the archive are being used. These questions will help the USGS determine users' dependence on Landsat imagery which is a measure of the value of the imagery.

2. Of all the **multispectral satellite imagery** (not panchromatic/black and white) that you have used **in the past year**, what percentage came from each of the following sensors or satellites? *Please enter a number from 0 to 100 on each line. The total must equal 100.*

Landsat (ETM+, TM, MSS)	
ALOS (AVNIR-2)	
ASTER	
AVHRR (or other NOAA polar orbiters)	
CBERS (CCD)	
Envisat (MERIS, AATSR)	
EO-1 (ALI)	
Formosat-2	
GeoEye-1	
IKONOS	
MODIS	
Quickbird	
Resourcesat-1/IRS (LISS, AWiFS)	
SPOT	
WorldView-2	

Other (please specify)_____

Total	**100**

3. Of all the Landsat imagery that you have used **in the past year**, what percentage came from each of the following sensors? *Please enter a number from 0 to 100 on each line. The total must equal 100.*

ETM+ (Landsat 7)	
TM (Landsats 4 and 5)	
MSS (Landsats 1, 2, 3, 4, and 5)	
Total	**100**

4. From which of the following time periods did the Landsat imagery that you have used in the past year come? *Please check all that apply.*
   ☐ 1972-1975
   ☐ 1976-1980
   ☐ 1981-1985
   ☐ 1986-1990
   ☐ 1991-1995
   ☐ 1996-2000
   ☐ 2001-2005
   ☐ 2006-2010

Questions 5 and 6 will be used to determine the importance of imagery for current work which will help us to describe the value of the information to users. Question 6 was added to address the issue of dependency directly. Though there are proxies for dependency in the survey, such as importance of Landsat imagery and the amount of work which would be discontinued if Landsat was no longer available, the issue of dependency was not addressed directly and the USGS requested it be added. This question will help USGS better understand the value of the imagery to users.

5. 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

6. Regardless of how much of your work used Landsat imagery, how **dependent** on the imagery were you to complete your work **in the past year**?

Not At	Slightly	Moderatel	Very	Completel

All Dependent	Dependent	y Dependent	Dependent	y Dependent
1	2	3	4	5

Question 7 was modified based on consultation with USGS to provide more specific information about how respondents are using Landsat. The USGS will use this information to examine differences in the current uses of imagery, as well as the requirements needed for the imagery to be useful to different groups. The USGS will be better able to provide imagery which suits the needs of various groups with this information.

7. Which of the following best characterizes you as a user of Landsat imagery? *Please select only one answer.*
    - ☐ Data provider (provide imagery for someone else to use)
    - ☐ Technical user (work on technical issues specifically related to the imagery, such as developing algorithms)
    - ☐ End user (apply imagery or products derived from the imagery to accomplish my work, including scientific research and education)
    - ☐ Manager (supervise technical and/or end users; also may make decisions based on work which uses the imagery)

Question 8 was added at the request of USGS to identify operational versus non-operational users. This information will be used to better understand any differences between the imagery needs of the two groups and how future events (such as the loss of Landsat 5 imagery) might impact them.

8. Which of the following best describes your use of Landsat imagery? *Please select only one answer.*
    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., scientific research).
    - ☐ I use Landsat imagery **primarily** for operational work.
    - ☐ I use Landsat imagery **primarily** for non-operational work.
    - ☐ I use Landsat imagery for a mix of operational and non-operational work.

Section 2

Section 2 explores more specifically the ways in which respondents are using Landsat imagery, as well as the importance of the imagery and the benefits which may accrue from projects using the imagery. The USGS will be better able to respond to the needs of their users, as well as determine some of the benefits of Landsat imagery from these questions. Each question was modified to include the time frame in which we were asking the respondents to consider the questions to ensure that all respondents were answering based on the same time frame.

Please tell us how you have used Landsat imagery in your projects over the past year. Projects include any operational tasks which are ongoing.

Questions 9 and 10 further characterize the ways in which Landsat imagery is being used. This information will be used by the USGS to understand the scope of the use of Landsat imagery and thus the value of the imagery. The response choices for both questions were expanded based on comments made in the original survey, as well as comments made by peer reviewers, and to allow respondents to more accurately describe their projects.

9. At what scales were your projects that used Landsat imagery **over the past year**? *Please check all that apply.*
   - ☐ Local (e.g., county, city)
   - ☐ More than one local entity (e.g., multi-county)
   - ☐ State/Province/Department/Region
   - ☐ Multi-state, province, department, or region
   - ☐ National
   - ☐ Continental
   - ☐ Global

10. In what regions were these projects focused **over the past year**? *Please check all that apply.*
    - ☐ Arctic
    - ☐ Antarctic
    - ☐ Canada
    - ☐ United States
    - ☐ Mexico
    - ☐ Caribbean
    - ☐ Central America
    - ☐ South America
    - ☐ Europe
    - ☐ Africa
    - ☐ Asia (not including the Middle East)
    - ☐ Middle East
    - ☐ Oceania (Australia/New Zealand/Melanesia/Micronesia/Polynesia)

Question 11 is included to separate U.S.-based users from internationally-based users in order to facilitate comparisons between the two groups. This will help the USGS understand how domestic and international users' needs may be similar or different.

11. Regardless of where your projects are located, are **you** located in the United States? *Please select only one answer.*
    - ☐ Yes
    - ☐ No

Questions 12 and 13 will help the USGS determine the breadth of applications of Landsat imagery, thus helping to ascertain the value of the imagery and to demonstrate the potential of the imagery in various fields. Two applications (cryospheric science and alternative energy development) have been added to the answer choices based on responses to the original survey.

12. What is the **primary** application for which you have used Landsat imagery **in the past year**?
Please select only one answer.

- ☐ Agricultural forecasting
- ☐ Agricultural management/production/conservation
- ☐ Biodiversity conservation
- ☐ Climate science/change
- ☐ Coastal science/monitoring/management
- ☐ Cryospheric science (e.g., sea ice, ice caps, glaciers)
- ☐ Ecological/ecosystem science/monitoring
- ☐ Fish and wildlife science/management
- ☐ Fire science/management
- ☐ Forest science/management
- ☐ Geology
- ☐ Land use/land cover change
- ☐ Energy (e.g., oil, natural gas, coal)/metals/minerals exploration/extraction/development
- ☐ Alternative energy exploration/development (e.g., wind, solar, geothermal)
- ☐ Range/grassland science/management
- ☐ Recreation science/management
- ☐ Water resources (e.g., watershed management, water rights, hydrology)
- ☐ Rural planning and development (e.g., zoning, economic development, land use)
- ☐ Urban planning and development (e.g., zoning, economic development, land use)
- ☐ Urbanization (e.g., growth, sprawl)
- ☐ Engineering/construction/surveying
- ☐ Assessments and taxation
- ☐ Real estate/property management
- ☐ Cultural resource management/anthropology/archaeology
- ☐ Software development
- ☐ Telecommunications
- ☐ Transportation
- ☐ Utilities
- ☐ Education: K-12
- ☐ Education: university/college
- ☐ Technical training (e.g., workshops, short courses)
- ☐ Emergency/disaster management

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- ☐ Hazard insurance (e.g., crop, flood, fire)
- ☐ Humanitarian aid
- ☐ Public health
- ☐ Defense/national security
- ☐ Environmental regulation
- ☐ Law enforcement
- ☐ Other application (please specify) _____

13. In addition to the primary application, in what other areas have you used Landsat imagery **in the past year**? *Please check all that apply.*
- ☐ **I have not used it in other areas.**
- ☐ Agricultural forecasting
- ☐ Agricultural management/production/conservation
- ☐ Biodiversity conservation
- ☐ Climate science/change
- ☐ Coastal science/monitoring/management
- ☐ Cryospheric science (e.g., sea ice, ice caps, glaciers)
- ☐ Ecological/ecosystem science/monitoring
- ☐ Fish and wildlife science/management
- ☐ Fire science/management
- ☐ Forest science/management
- ☐ Geology
- ☐ Land use/land cover change
- ☐ Traditional energy (e.g.,oil, natural gas, coal)/metals/minerals exploration/extraction/development
- ☐ Alternative energy exploration/development (e.g., wind, solar, geothermal)
- ☐ Range/grassland science/management
- ☐ Recreation science/management
- ☐ Water resources (e.g., watershed management, water rights, hydrology)
- ☐ Rural planning and development (e.g., zoning, economic development, land use)
- ☐ Urban planning and development (e.g., zoning, economic development, land use)
- ☐ Urbanization (e.g., growth, sprawl)
- ☐ Engineering/construction/surveying
- ☐ Assessments and taxation
- ☐ Real estate/property management
- ☐ Cultural resource management/anthropology/archaeology
- ☐ Software development
- ☐ Telecommunications
- ☐ Transportation

- ☐ Utilities
- ☐ Anthropology/archaeology/cultural resource management
- ☐ Education: K-12
- ☐ Education: university/college
- ☐ Technical training (e.g., workshops, short courses)
- ☐ Emergency/disaster management
- ☐ Hazard insurance (e.g., crop, flood, fire)
- ☐ Humanitarian aid
- ☐ Public health
- ☐ Defense/national security
- ☐ Environmental regulation
- ☐ Law enforcement
- ☐ Other application (please specify) _____

Questions 14 and 15 are designed to understand general trends in the use of Landsat imagery. This information will help the USGS better meet the needs the existing needs of users as well as the future needs.

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14. **Within the past 10 years**, how would you characterize your use of Landsat imagery? *Please select only one answer.*
     - ☐ My use has increased.
     - ☐ My use has stayed more or less the same.
     - ☐ My use has decreased.
     - ☐ I cannot characterize my use within the past 10 years.

15. **In the next 5 years**, how will your use of Landsat imagery likely change? *Please select only one answer.*
     - ☐ My use will increase.
     - ☐ My use will stay more or less the same.
     - ☐ My use will decrease.
     - ☐ I will no longer use Landsat imagery.
     - ☐ I cannot characterize my use over the next 5 years.

If answered 1 or more for TM on Q3 →Q16; all others→Q19

Questions 16 -18 are designed to understand the potential impacts of a loss of Landsat 5 imagery on users. Because Landsat 7 imagery is incomplete, the loss of Landsat 5 may impact some users disproportionately. This information will be used by USGS to mitigate the impacts on those users.

Prior to the projected launch of the new Landsat satellite in late 2012, it is possible that Landsat 5 will cease operation and current TM imagery will no longer be available. Imagery from Landsat 7 is expected to still be available but contains gaps due to the Scan Line Corrector anomaly (SLC-off) which occurred in 2003.

16. How do you believe the loss of current TM imagery from Landsat 5 would impact the amount of Landsat imagery you use? *Please select only one answer.*
- ☐ My use will not change because of it.
- ☐ My use will increase because of it.
- ☐ My use will decrease because of it.
- ☐ My use will cease because of it.
- ☐ I do not know how it will impact my use.

17. Which of the following actions would you take in regards to the loss of current TM imagery from Landsat 5? *Please check all that apply.*
- ☐ I would not take any actions in regards to the loss of TM imagery.
- ☐ I would replace Landsat 5 imagery with non-gap-filled ETM+ imagery from Landsat 7.
- ☐ I would replace Landsat 5 imagery with gap-filled ETM+ imagery from Landsat 7
- ☐ I would replace Landsat 5 imagery with imagery from other satellite sensors.
- ☐ I would replace Landsat 5 imagery with other kinds of data, such as data from fieldwork or other data sets.

18. How do you believe this event would impact your work? *Please check all that apply.*
- ☐ It would not impact my work.
- ☐ It would make my work more time consuming.
- ☐ It would make my work more expensive.
- ☐ It would decrease the quality of my work.
- ☐ It would decrease the scope of my work.
- ☐ Other (please specify) _____

Question 19 will allow the USGS to know more about future uses of the imagery. This information is important to decision makers as they consider future missions of Landsat. For effective configuration and specifications of future missions, it is important to understand the potential new uses of the imagery. This question is open-ended because the new and unique uses of the imagery are by definition unknown and constantly changing.

19. New and unique uses for Landsat imagery continue to emerge as more people have access to the data and the means to manipulate it. What new or unique uses do you envision for Landsat imagery **in the next 5 years**? *(Open-ended - limit 1500 characters)*

Please answer the following questions about the importance of Landsat imagery to your work, your satisfaction with the imagery and the benefits the imagery provides.

Question 20 determines the types of processing that are most important to users of Landsat imagery. Understanding these preferences will aid in the creation of more useful products for the user community.

20. How important are the following types of Landsat imagery to your work? *Please select only one answer for each type of imagery.*

	Very Unimportant	Somewhat Unimportant	Neither Important nor Unimportant	Somewhat Important	Very Important
Raw, unprocessed imagery	-2	-1	0	1	2
A basic, processed product that is calibrated, geo-referenced, and orthorectified	-2	-1	0	1	2
A processed product that is calibrated, geo-referenced, orthorectified, *and* adjusted for surface reflectance	-2	-1	0	1	2
A derived product such as vegetation condition, change area, or land cover map	-2	-1	0	1	2

Questions 21-23 explore the importance of and satisfaction with various attributes of Landsat imagery. The attributes are a mix of those that can be changed with relative ease (e.g., accessibility, cost, etc.) and those which cannot be changed easily (e.g., spatial, spectral, or temporal resolution). By determining the importance of and satisfaction with these attributes, the USGS can evaluate the need to make changes to current and future satellite missions in order to better serve the user community.

21. How important are the following in your decision to use Landsat imagery for these projects, as opposed to other types of moderate-resolution imagery? *Please select only one answer for each row.*

	Very Unimportant	Somewhat Unimportant	Neither Important nor Unimportant	Somewhat Important	Very Important
Accessibility	-2	-1	0	1	2
Archive/continuity	-2	-1	0	1	2
Area/footprint of an individual scene	-2	-1	0	1	2
Availability	-2	-1	0	1	2
Cost	-2	-1	0	1	2
Data already processed	-2	-1	0	1	2
Data quality	-2	-1	0	1	2
Delivery time	-2	-1	0	1	2
Ease of use	-2	-1	0	1	2
Extent of coverage	-2	-1	0	1	2
Familiarity with Landsat	-2	-1	0	1	2
Licensing/distribution restrictions	-2	-1	0	1	2
Spatial resolution	-2	-1	0	1	2

Spectral bands/resolution	-2	-1	0	1	2
Temporal resolution/ frequency of coverage	-2	-1	0	1	2
Thermal band	-2	-1	0	1	2
Time savings	-2	-1	0	1	2

22. Overall, how important is Landsat imagery in your current work? *Please select only one answer.*

Very Unimportant	Somewhat Unimportant	Neither Important nor Unimportant	Somewhat Important	Very Important
-2	-1	0	1	2

23. How satisfied are you with the following attributes of Landsat imagery as they exist today? *Please select only one answer for each attribute.*

	Very Dissatisfied	Somewhat Dissatisfied	Neither Satisfied nor Dissatisfied	Somewhat Satisfied	Very Satisfied
Accessibility	-2	-1	0	1	2
Archive/continuity	-2	-1	0	1	2
Area/footprint of an individual scene	-2	-1	0	1	2
Availability	-2	-1	0	1	2
Cost	-2	-1	0	1	2
Data quality	-2	-1	0	1	2
Delivery time	-2	-1	0	1	2
Ease of use	-2	-1	0	1	2
Extent of coverage	-2	-1	0	1	2
Licensing/distribution restrictions	-2	-1	0	1	2
Spatial resolution	-2	-1	0	1	2
Spectral bands	-2	-1	0	1	2
Temporal resolution/ frequency of coverage	-2	-1	0	1	2
Thermal band	-2	-1	0	1	2

Please answer the following two questions considering the work you have conducted **over the past 5 years** that has used Landsat imagery.

Questions 24 and 25 will help the USGS to measure a baseline level of benefits of Landsat imagery, as well as understand the importance of Landsat imagery as a source of information in decision-making. The importance of Landsat imagery providing information used in decision-making will help USGS understand the value of the imagery. USGS program officers also need to understand the current level of the societal benefits of Landsat imagery to all users in order to increase those benefits. While a comprehensive list of benefits was provided by the original survey, the extent of those benefits was not measured.

Questions 24 and 25 have been changed to close-ended questions based on the analysis of open-ended responses to the original questions. The responses to the original Question 24 fell into two categories: 1) the benefits of using of Landsat in decision-making and 2) the importance of Landsat as a source of information in decision-making. All benefits, including those in response to the original decision-making question (now Question 24), are now listed under Question 25 and Question 24 has been modified to ask about Landsat specifically as a source of information in decision-making.

Additionally, instructions were added which expanded the time frame which respondents should be thinking about. Respondents are asked to think about all their projects in the past 5 years as opposed to in the past year. This was changed in response to comments from the original survey which indicated that one year was too limiting given the multi-year nature of many projects.

24. Compared to other sources of information, how important have results from your work been in influencing decision-making (e.g., policy changes, land management planning)? *Please select only one.*

Very Unimportant	Somewhat Unimportant	Neither Important nor Unimportant	Somewhat Important	Very Important
-2	-1	0	1	2

25. In your opinion, how would you characterize the following benefits from your work that used Landsat in the past 5 years? *Please select only one for each benefit.*

	Benefit not observed	Minor benefit	Moderate benefit	Substantial benefit
Protecting/conserving the environment and/or improving environmental conditions	1	2	3	4
Maintaining or improving the provision of ecosystem services	1	2	3	4
Improving long-term planning or monitoring	1	2	3	4
Improving the decision-making process through better communication of concepts/issues to decision-makers and/or the public	1	2	3	4
Enforcing regulations, legislation, or policies	1	2	3	4
Resolving disputes and/or reducing conflicts	1	2	3	4
Reducing risks to humans or increasing human safety (e.g., faster response to disasters or protection from environmental contamination)	1	2	3	4

Section 3

Section 3 is designed to understand trends in the use of Landsat imagery based upon key events which have occurred or will occur regarding Landsat imagery. Additionally, new users are identified in this section to enable comparisons between new and established users. Understanding the impacts of these events and knowing more about new users is critical to the USGS for planning future satellite missions and providing relevant imagery to all their users.

Please answer the following questions about your acquisitions of Landsat imagery.

Beginning in the fall of 2008, Landsat imagery became available at no cost from the USGS Earth Resources Observation and Science (EROS) Center which provides imagery via the GloVis and Earth Explorer websites. Please answer the following questions regarding imagery acquisitions for your projects before and after the imagery became available at no cost from EROS.

Question 26 was added to distinguish between new, established, and returning users. The results from this question will be used to compare these groups and their uses of the imagery, since any differences or similarities between these groups are currently unknown. Question 27 is asked only of the returning users in order to establish their reasons for beginning to use Landsat again. The USGS will use the information from these questions to better provide for the imagery needs of these groups.

26. Which of the following best characterizes your use of Landsat? *Please select only one answer.*

☐ I had never used Landsat imagery before it became available at no cost from EROS. → *Q29*

☐ I have used Landsat imagery both before and after it became available at no cost from EROS. →*Q28*

☐ Though I used Landsat imagery in the past, I had switched to using other types of data in my work before Landsat imagery became available at no cost from EROS.

27. Why did you start using Landsat imagery again? *Please check all that apply.*
    ☐ Landsat imagery became available at no cost from EROS.
    ☐ My work requires Landsat imagery.
    ☐ Landsat imagery is more easily accessible.
    ☐ Landsat imagery is more readily available.
    ☐ Data quality is sufficient for my needs.
    ☐ The spatial resolution meets my needs.
    ☐ The available spectral bands meet my needs.
    ☐ The temporal resolution/frequency of coverage meets my needs.
    ☐ Other (please specify) _____

Questions 28-37 determine the number of Landsat scenes respondents are acquiring, as well as where they are acquiring scenes and how much they paid for them both before and after the imagery became available at no cost. This information will be used to determine the impact of the no cost data policy on user acquisitions. Understanding current and past imagery acquisition practices helps determine the imagery's value to users as well as improve the provision of imagery to users.

28. Where was Landsat imagery acquired for your projects **before** it became available at no cost? *Please check all that apply.*
    ☐ AmericaView
    ☐ USGS EROS (GloVis, Earth Explorer)
    ☐ Other federal government agencies (besides USGS)
    ☐ Global Land Cover Facility
    ☐ Internet in general
    ☐ Landsat.org
    ☐ Landsat International Cooperators/ International Ground Stations
    ☐ Universities or other academic institutions
    ☐ State governments
    ☐ Commercial businesses
    ☐ Colleagues or other individuals
    ☐ Other (please specify) _____
    ☐ Don't know

29. In **2010**, which more accurately describes the average number of Landsat scenes acquired for your projects?

☐ One or more per month → *Answer following questions on a per month basis*

☐ Less than one per month → *Answer following questions on a per year basis*

New users (Q26, answer 1)→Q34; all other uses→Q30

30. Approximately how many Landsat scenes were acquired for your projects **per month/per year** from all sources **before** the imagery became available at no cost?

Number of scenes per month/per year _____

31. What percentage of these scenes was acquired from **USGS EROS** (GloVis, Earth Explorer)?

Percentage of scenes acquired from EROS_____

32. Approximately how much was spent **per month/per year** on Landsat imagery for your projects **before** the imagery became available at no cost?

Dollars per month/per year spent _____

33. What percentage of this amount was spent on imagery acquired from **USGS EROS** (GloVis, Earth Explorer)?

% spent on imagery acquired from EROS _____

34. Where has Landsat imagery been acquired for your projects **since** it became available at no cost? *Please check all that apply.*

☐ AmericaView

☐ USGS EROS (GloVis, Earth Explorer)

☐ Other federal government agencies (besides USGS)

☐ Global Land Cover Facility

☐ Internet in general

☐ Landsat.org

☐ Landsat International Cooperators/ International Ground Stations

☐ Universities or other academic institutions

☐ State governments

☐ Commercial businesses

☐ Colleagues or other individuals

☐ Other (please specify) _____

☐ Don't know

35. Approximately how many Landsat scenes have been acquired for your projects **per month/per year** from all sources [EROS] **since** the imagery became available at no cost?

Number of scenes acquired per month/per year _____

36. What percentage of these scenes has been acquired from **USGS EROS** (GloVis, Earth Explorer)?

     Percentage of scenes acquired from EROS _____

37. Approximately how much has been spent, if any, **per month/per year** on Landsat imagery or products derived from the imagery for your projects **since** it became available at no cost?

     Dollars spent per month/per year _____

Questions 38-40 are designed to understand the potential impacts of the launch of a new Landsat satellite on the respondents' use of Landsat imagery. Question 40 is open-ended to allow the greatest variety of responses to this future scenario. This information will be used by USGS anticipate users' responses to this event.

As you may know, a new Landsat satellite (Landsat Data Continuity Mission or LDCM) is scheduled to be launched at the end of 2012 and will replace Landsat 5. The new imagery will be available at no cost. Please tell us how you believe this event will impact your acquisitions of Landsat imagery.

38. How do you believe this event will impact the amount of Landsat imagery you use? *Please select only one answer.*

    ☐ My use will not change because of it. →*Q40*
    ☐ My use will increase because of it.
    ☐ My use will decrease because of it.
    ☐ My use will cease because of it.
    ☐ I do not know how it will impact my use. →*Q40*

39. By what percentage will the number of Landsat scenes you acquire for your projects **per month/per year** from all sources increase [decrease] once imagery from LDCM becomes available? *Please write a number in the box below or check "Don't know".*

             Percentage

       |_____| ☐ Don't know

40. Regardless of the impact on the amount of imagery you procure, how do you believe the launch of LDCM will impact your work? *(Open-ended - limit 1500 characters)*

New users (Q26, answer 1)→ Q41; all other users→Q45.

Questions 41-44 have been added and are directed at new users of Landsat imagery. Understanding the reasons why users began using Landsat will help the USGS better provide imagery to those users.

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41. You stated that you had not used Landsat imagery until it became available at no cost. Did you use any kind of satellite imagery before you began using Landsat? *Please select only one answer.*

☐ Yes
☐ No → *Q45*
☐ Don't know → *Q45*

42. What kind of satellite imagery were you using before you began using Landsat? *Please check all that apply.*

☐ Low-resolution satellite imagery (120 meter or larger resolution – e.g., AVHRR, MODIS)
☐ Moderate-resolution satellite imagery (5-120 meter resolution - e.g., ALOS AVNIR-2, ASTER, AWiFS, CBERS CCD, SPOT)
☐ High-resolution satellite imagery (less than 5 meter resolution – e.g., GeoEye, IKONOS, QuickBird)

43. Did Landsat imagery **replace** other satellite imagery in your work? *Please select only one answer.*

☐ Yes
☐ No → *Q45*
☐ Don't know → *Q45*

44. Why did you replace other satellite imagery with Landsat imagery? *Please check all that apply.*

☐ Landsat imagery became available at no cost.
☐ My work required Landsat imagery.
☐ Landsat imagery is more easily accessible.
☐ Landsat imagery is more readily available.
☐ Data quality is sufficient for my needs.
☐ The spatial resolution meets my needs.
☐ The available spectral bands meet my needs.
☐ The temporal resolution/frequency of coverage meets my needs.
☐ Other (please specify) _____

Section 4

Section 4 explores the value of Landsat imagery. This information will help the USGS make decisions about future satellite missions as well as the current provision of data.

Please tell us about the value of Landsat imagery in your work.

The following series of questions (45-65) are needed to measure the value of information that Landsat imagery provides to professional Landsat users. According to Macauly (2006), measuring the value of information derived from earth science data requires information on: 1) what the outputs save; 2) what users would do without the outputs (i.e., how much more would it

cost or how less effective results would be); and 3) what users are willing to pay to use the outputs. Questions 45-56 measure the first two pieces of information suggested by Macauly (2006), that is, what Landsat imagery saves respondents and what they would do without the imagery. The third measure suggested by Macauly (2006) requires that we ask what users are willing to pay to use the outputs (questions 57-65). The detailed cost questions are important in assisting the respondent in constructing total costs. Further, potential changes in value of information are different if the underlying costs are largely fixed versus largely variable.

Questions 45-65 are needed to measure the value that Landsat imagery provides to users. As explained in the Supporting Statement, the USGS is responsible for ensuring data continuity if a break in provision of Landsat imagery does occur. USGS will be required to immediately provide replacement imagery and must ensure the investment in supplying replacement imagery is equivalent to the value of the existing imagery. USGS must understand the user demand and preferences in order to select an effective and appropriate alternative imagery. The USGS must negotiate prices to acquire substitute imagery from other providers in the event of a gap in Landsat coverage. They must also know how many scenes users would purchase at alternative prices, and what would happen to the quantity of scenes demanded if USGS passed on the cost of purchasing substitute imagery.

Questions 57-65 measure users' willingness to pay (WTP) by use of a sequenced, double-bounded, dichotomous-choice, series of willingness to pay questions. The rationale for these questions is that a user's maximum WTP would be capped at the cost savings from using Landsat, or alternatively, WTP to avoid the cost increase without Landsat. This will reveal the demand curve for Landsat imagery.

Questions 45-56 identify how the user would be affected if Landsat imagery was no longer available, both in terms of the effects on their work and the preferred sources of replacement imagery. This information will help the USGS establish the appropriate range of replacement imagery necessary to ensure data continuity.

45. To better understand the value of Landsat imagery, the following questions explore the potential impact to your work **if new and archived Landsat imagery was no longer available.**

If new and archived Landsat imagery was no longer available, you could choose to:
- discontinue some or all of your work;
- continue your work without substituting other imagery or information; or
- use other imagery or information as a substitute in your work.

Of your work that uses Landsat imagery, what percentage would you **discontinue, continue without substituting other imagery or information,** and/or **use other imagery or information as a substitute** if the imagery was no longer available? *Please write a number from 0 to 100 in the box next to each action OR check "Don't know".*

Percentage

Work discontinued		☐ Don't know
Work continued without substituting other imagery or information		☐ Don't know
Work using other imagery or information as a substitute		☐ Don't know

Respondents who write 1-100 in the substitute box →*Q46; all others*→*Q50*

Question 46 will only be answered by respondents who wrote 1-100 in the "Work using other imagery or information as a substitute" action in Question 43.

46. Of your work that would **use other imagery or information as a substitute**, what percentage would use each of the following types of imagery or information? *Please write a number from 0 to 100 in the box next to each type of imagery or information OR check "Don't know".*

	Percentage	
Different type of imagery		☐ Don't know
Other data sets (not other imagery)		☐ Don't know
On-the-ground fieldwork		☐ Don't know

Respondents who write 1-100 in the different imagery box →*Q47; all other*→*Q50*

Questions 47-49 explore user preferences and demand for alternative imagery. The response choices for 47 and 48 have been expanded based on responses to the first survey. This information will be used by the USGS to select appropriate replacement imagery in the event of a gap in Landsat imagery. These questions will only be answered by respondents who write 1-100 in the "Different type of imagery" box in Question 46.

47. Which moderate-resolution imagery would be your preferred substitute (regardless of budget constraints)? *Please select only one answer.*
- ☐ ALOS (AVNIR-2)
- ☐ ASTER
- ☐ AVHRR (or other NASA polar orbiters)
- ☐ CBERS (CCD)
- ☐ Envisat (MERIS, AATSR)

☐ EO-1 (ALI)
☐ Formosat-2
☐ GeoEye-1
☐ IKONOS
☐ MODIS
☐ Resourcesat-1/IRS (LISS, AWiFS)
☐ SPOT
☐ WorldView-2
☐ Other (please specify) _____

48. Given your current budget constraints, which moderate-resolution imagery would you most likely use as a substitute? *Please select only one answer.*
☐ ALOS (AVNIR-2)
☐ ASTER
☐ AVHRR (or other NASA polar orbiters)
☐ CBERS (CCD)
☐ Envisat (MERIS, AATSR)
☐ EO-1 (ALI)
☐ Formosat-2
☐ GeoEye-1
☐ IKONOS
☐ MODIS
☐ Resourcesat-1/IRS (LISS, AWiFS)
☐ SPOT
☐ WorldView-2
☐ Other (please specify) _____

49. Approximately how many scenes of this imagery would you purchase **per month [year]** to replace Landsat imagery if it was no longer available?

Number of scenes per month [year] _____

Questions 50 and 51 will identify the extent different types of user costs would be affected if Landsat imagery was no longer available. This information will be used by the USGS to understand the impacts on users in the event of a break in the provision of the imagery. USGS will consider these impacts and how to minimize them in selecting appropriate alternative imagery.

50. If Landsat imagery was no longer available, how likely is it that the following would occur? *Please select only one answer for each scenario.*

	Highly	Somewhat	Neither likely nor	Somewhat	Highly

	unlikely	unlikely	unlikely	likely	likely
My overall costs would increase.	-2	-1	0	1	2
I would hire more staff.	-2	-1	0	1	2
I would purchase additional equipment and/or software.	-2	-1	0	1	2
I would incur additional processing costs for substitute data or other imagery.	-2	-1	0	1	2
The time my colleagues and/or I spend on my projects would increase.	-2	-1	0	1	2
There would be additional administration and/or overhead costs.	-2	-1	0	1	2
Additional training would be required to be able to use data that replaces Landsat.	-2	-1	0	1	2

51. If there are other costs that would increase if Landsat imagery was no longer available, please list them here. *(Open-ended – limit 250 characters)*

Questions 52 and 53 will be used to verify the minimum value of the imagery to users estimated from the WTP responses by analyzing the current costs associated with the imagery in conjunction with the percent increase in costs. This will be included as a variable to measure the size of the company in the CVM dichotomous choice logit model.

52. If new and archived Landsat imagery was **no longer available**, what would be the total percent increase in costs for your work that uses Landsat imagery? *Please write a number in the box below or check "Don't know".*

Percentage

☐ Don't know

Respondents who write 1or greater in the box →Q53; all others→Q54

53. What is the current total dollar amount upon which your percentage increase in costs is based? *Please enter a dollar amount.* $_____

Questions 54-56 provide unique information as to the value-added and services provided by the imagery user. An important problem with valuing information is its public good characteristic of non-excludability. Images, once purchased for a specific cost, can be value-added and sold to multiple users. This value-added component is an important part of the value of information which is in addition to the cost of information and may be substantial.

54. How would your revenue or funding for your work that uses Landsat imagery be impacted, if the imagery was no longer available? *Please select only one answer.*

☐ Revenue or funding would increase.
☐ Revenue or funding would decrease.
☐ Revenue or funding would neither increase nor decrease. → *Q57*
☐ Don't know → *Q57*

55. By what percent would your revenue or funding increase [decrease]? *Please write a number in the box below or check "Don't know".*

Percentage

☐ Don't know

Respondents who write a number in the box →Q56; all others→Q57

56. What is the current total dollar amount upon which your percentage increase [decrease] in revenue or funding is based? *Please enter a dollar amount.* $_____

Questions 57-65 measure the third component of the value of information as described by Macauly (2006): What are users willing to pay for Landsat imagery? One of the primary purposes of this survey is to determine the value of Landsat imagery; therefore, information about respondents' willingness to pay for imagery is essential.

Questions 57 and 60 are sequenced, double-bounded, dichotomous-choice, willingness to pay (WTP) questions. Such questions capitalize on the strengths of the binary dichotomous choice format by requiring only a market-like "Yes" or "No" response, yet greatly improve the precision and statistical efficiency of the WTP estimates. Asking the respondent the follow-up WTP question conditional to their answer to the first dichotomous choice question allows for bracketing of the respondents WTP between the two dollar amounts. Thus a "Yes" response to $X and a "No" response to $Y (where $X<$Y), brackets a respondent's WTP between $X and $Y. Likewise a "No" response to $X followed by a "Yes" response to $Z (where $X>$Z) brackets a respondent's WTP between $X and $Z. The "$XXX" in Q57 will be replaced with the different bid amounts of which each respondent will randomly be given one amount ($25, $50, $75, $100, $200, $300, $400, $500, $600, $750, $1000, $1500, $2000, $2500, $3000, $3500, $4000, $4500, $5000, or $7500). These amounts are based off the real world prices of substitute imagery and were decided upon in conjunction with Dr. John Loomis of Colorado State University. Currently, the prices for one scene of other moderate-resolution imagery range from zero (CBERS imagery) to around $4,000 (Resourcesat imagery). However, many sensors produce a smaller scene than a Landsat scene, meaning that more than one scene would be required to replace a single Landsat scene. After taking into account how many replacement scenes would be needed for each type of imagery, the highest cost rises to more than $12,000 (SPOT imagery). However, it would be corporations, not individual users that would be investing in these multiple scenes at the higher end of the cost scale. The range of prices for individual scenes ($0-$4,000) best represents the range of substitutes to individual users. Placing the highest bid amount at $5,000 will capture the full demand curve of our target audience

(users).

Questions 58 and 61 measure respondents' uncertainty in regard to their willingness to pay responses; this allows for the incorporation of this factor in the statistical analysis. The literature has shown that incorporating respondent uncertainty can increase the goodness of fit and decrease the standard error in willingness to pay models. The linear certainty scale is the same scale used in Champ et al (1997) and Ekstrand and Loomis (1998). This numerical scale is required for the statistical analysis. The uncertainty scale will allow us to calibrate the stated WTP to better match what cash validity studies show as WTP. In particular, by coding only "Yes" responses with a certainty of 70%, 80%, 90%, or 100%, and recoding the less certain "Yes" responses to "No" responses, there is evidence that the resulting WTP better matches cash validity WTP (Ethier et al, 2000).
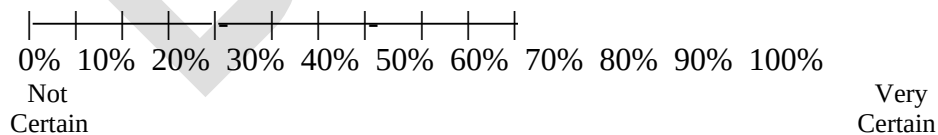
Questions 59, 62, and 64 are follow-up questions to determine how many images would be purchased at the given bid amount in order to calculate the total amount each respondent would be willing to pay.

Question 63 is a follow-up for respondents that reply "No" to both Questions 57 and 60. The purpose of this question (and the follow-up Q65) is to check for protest responses from individuals who would say no regardless how low the bid amount is.

57. If Landsat 5 and 7 became inoperable before the next Landsat satellite is operational (scheduled to launch in 2012), you may have to obtain imagery elsewhere during the interim. Assume that you are restricted to your current project or agency budget level and that the money to pay this cost would have to come out of your existing budget. If such a break in continuity did occur and you had to pay for imagery that was equivalent to the Landsat standard product now available, would you pay $*XXX* for one scene covering the area equivalent to a Landsat scene?
  ☐ Yes
  ☐ No

58. How certain are you that you would [not] pay $*XXX (same as Q57)* for the imagery? *Please select the percentage that best represents your answer.* →*Q59 if "Yes" to Q57; Q63 if "No" to Q57*

$$|\!\!-\!\!+\!\!-\!\!+\!\!-\!\!+\!\!-\!\!|\!\!-\!\!+\!\!-\!\!+\!\!-\!\!|\!\!-\!\!+\!\!-\!\!+\!\!-\!\!|$$
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Not   Very
Certain   Certain

59. Approximately how many scenes would you buy **per month [year]** if each scene cost $*XXX (same as Q57)*? *(Open-ended – limit 10 characters)*

The cost in Question 60 will be determined by the initial amount stated in Q57 and the respondent's answer to Q57. If the respondent answers "Yes" to Q57, the amount in Q60 will be **1.25** times the amount in Q57 (i.e., $500 in Q57 would result in $625 in Q60). If the respondent

answers "No" to Q57, the amount in Q60 will be **0.75** times the amount in Q57 (i.e., $500 in Q57 would result in $375 in Q60).

60. If the cost was $*XXX*, would you pay this amount for one scene covering the area equivalent to a Landsat scene?

☐ Yes
☐ No

61. How certain are you that you would [not] pay $*XXX (same as Q60)* for the imagery? *Please select the percentage that best represents your answer.* →*Q62 if "Yes" to Q60; Q69 if "Yes to Q57 and "No" to Q60; Q63 if "No" to Q57 and "No" to Q60*

```
|——|——|——|——|-——|——|——|-——|——|——|
0%  10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
```
Not   Very
Certain   Certain
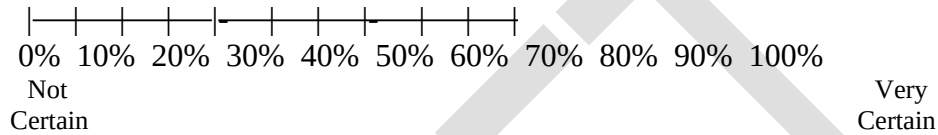
62. Approximately how many scenes would you buy **per month [year]** if each scene cost $*XXX (same as Q60)*? *(Open-ended – limit 10 characters)* →*Q69*

63. If the cost was $1, would you pay this amount for one scene covering the area equivalent to a Landsat scene?

☐ Yes
☐ No →*Q65*

64. Approximately how many scenes would you buy **per month [year]** if each scene cost $1? *(Open-ended – limit 10 characters)* →*Q69*

65. Please tell us why you would not pay $1 for the imagery. *(Open-ended - limit 1500 characters)* →*Q69*

Questions 66-68 are for past Landsat users only. These questions will help determine why past users are not using the imagery currently, as well as what they are using instead. This information will help the USGS to understand how they could better serve the larger community of satellite users.

66. Of all the **multispectral satellite imagery** (not panchromatic/black and white) that you have used **in the past year**, what percentage came from each of the following sensors or satellites? *Please enter a number from 0 to 100 on each line. The total must equal 100.*

ALOS (AVNIR-2)	
ASTER	
AVHRR (or other NOAA polar orbiters)	

CBERS (CCD)	
Envisat (MERIS, AATSR)	
EO-1 (ALI)	
Formosat-2	
GeoEye-1	
IKONOS	
MODIS	
Quickbird	
Resourcesat-1/IRS (LISS, AWiFS)	
SPOT	
WorldView-2	
Other (please specify)_____	
Total	**100**

67. Have you ever used Landsat?
- ☐ Yes
- ☐ No →*Q69*
- ☐ Don't know →*Q69*

68. What are the reason(s) you are not currently using Landsat imagery? *Please check all that apply.*
- ☐ The scan line corrector anomaly (SLC-off) on Landsat 7 impacted data usability.
- ☐ My work does not require Landsat imagery.
- ☐ Landsat imagery is not easily accessible.
- ☐ Landsat imagery is not readily available.
- ☐ The cost of Landsat imagery is too high.
- ☐ Data quality is insufficient for my needs.
- ☐ Licensing or distribution restrictions are problematic.
- ☐ The spatial resolution does not meet my needs.
- ☐ The available spectral bands do not meet my needs.
- ☐ The temporal resolution/frequency of coverage does not meet my needs.
- ☐ Other imagery is more attractive.
- ☐ Other (please specify) _____

Section 5 consists of demographics questions. We need this information to provide a detailed picture of the Landsat imagery user community. Because Landsat imagery is now available at no cost, it is now accessible to a wider variety of users who may be quite different from the

established users. This information will be used to understand differences between various user groups so that USGS can better serve their users' needs.

Section 5

Please tell us a little about yourself. Your answers to these questions will help further characterize users of moderate-resolution imagery. Answers are in no way linked to any individual taking this survey.

69. In what sector do you work? *Please select only one answer.*
- ☐ Academic institution (e.g., university, college, technical/vocational)
- ☐ National/Federal government
- ☐ State/Provincial/Departmental government
- ☐ Local government (e.g., county, city)
- ☐ Private business
- ☐ Non-profit organization
- ☐ Tribe/Nation/Indigenous group
- ☐ Other (please specify) _____

70. How many years of formal schooling have you completed? *Please select only one answer.*

☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 +

(elementary school)   (middle school)   (secondary/ high school)   (university or technical school)   (graduate or professional school)

Questions 71-73 will allow the USGS to determine the extent to which respondents are professionally trained and involved in the user community. Question 71 was changed to a close-ended question based on responses to the first survey. Question 72 was added to determine whether experience level is related to other variables, such as type of use and applications. Again, with the advent of Landsat imagery available at no cost, the user community may be changing to include people who have different professional backgrounds and this information will allow USGS to better provide imagery to users.

71. Which of the following type(s) of education or training have you received related to remote sensing or GIS? *Please check all that apply.*
- ☐ University classes, degrees, or certificates
- ☐ Professional certifications from private organizations
- ☐ Workshops or short courses offered by public institutions (i.e., federal/state/local government, public universities)
- ☐ Workshops or short courses offered by private businesses (i.e., software vendors, consultants)
- ☐ On-the-job training/Self-taught

☐ Other (please specify) _____

72. How many years have you been using satellite imagery or GIS software? *Please write a number in the box below.*

Years   ☐

73. To which of the following remote sensing/GIS-related organizations do you belong? *Please check all that apply.*
- ☐ **I am not a member of any remote sensing/GIS-related organizations.**
- ☐ American Association for Geodetic Surveying (AAGS)
- ☐ American Congress of Surveying and Mapping (ACSM)
- ☐ American Geophysical Union (AGU)
- ☐ American Society of Photogrammetry and Remote Sensing (ASPRS)
- ☐ Asian Association on Remote Sensing (AARS)
- ☐ Association of American Geographers (AAG)
- ☐ Cartography and Geographic Information Society (CAGIS)
- ☐ Consortium for International Earth Science Information Network (CIESIN)
- ☐ Geographic and Land Information Society (GLIS)
- ☐ Geological Society of America (GSA)
- ☐ Geospatial Information and Technology Association (GITA)
- ☐ Ecological Society of America (ESA)
- ☐ IEEE Geoscience and Remote Sensing Society (GRSS)
- ☐ International Glaciological Society (IGS)
- ☐ International Society for Photogrammetry and Remote Sensing (ISRPS)
- ☐ National Council for Geographic Education
- ☐ National Society of Professional Surveyors (NSPS)
- ☐ National States Geographic Information Council (NSGIC)
- ☐ Remote Sensing and Photogrammetry Society (RESPoc)
- ☐ University Consortium for Geographic Information Science (UCGIS)
- ☐ Urban and Regional Information System Agencies (URISA)
- ☐ Other (please specify) _____

74. Are you…?
- ☐ Male
- ☐ Female

75. In what year were you born? _____

Questions 76 and 77 will provide information on underrepresented users of Landsat imagery. Decision makers would like to know the extent to which use has expanded to traditionally

underrepresented groups.

76. What ethnicity do you consider yourself? *Please select only one answer.*
- ☐ Hispanic or Latino
- ☐ Not Hispanic or Latino

77. From what racial origin(s) do you consider yourself? *Please check all that apply.*
- ☐ American Indian or Alaska Native
- ☐ White
- ☐ Black or African American
- ☐ Asian
- ☐ Native Hawaiian or Other Pacific Islander

Question 78 asks respondents to provide the contact information for other Landsat users. The results of the last survey indicate that many users do not visit EROS to obtain Landsat imagery and thus would not be included in the sample for this survey. This information will be used to create a snowball sample of users who do not obtain imagery from EROS, in an effort to reach the broadest sample of Landsat users possible.

78. We would like to give as many Landsat users as possible a chance to give us their input. If you know of others who use Landsat imagery, please enter the emails of up to three other users below. The information you provide is completely confidential and will only be used in connection with this survey.

    1. _____

    2. _____

    3. _____

Question 79 allows respondents to express any additional thoughts or concerns about the issues raised in the survey. The responses will be analyzed to determine any unforeseen issues or problems with Landsat imagery that the USGS may choose to address.

79. 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)*