RADARSAT INTERNATIONAL

Satellite Cities

Karen Stewart, City of Surrey

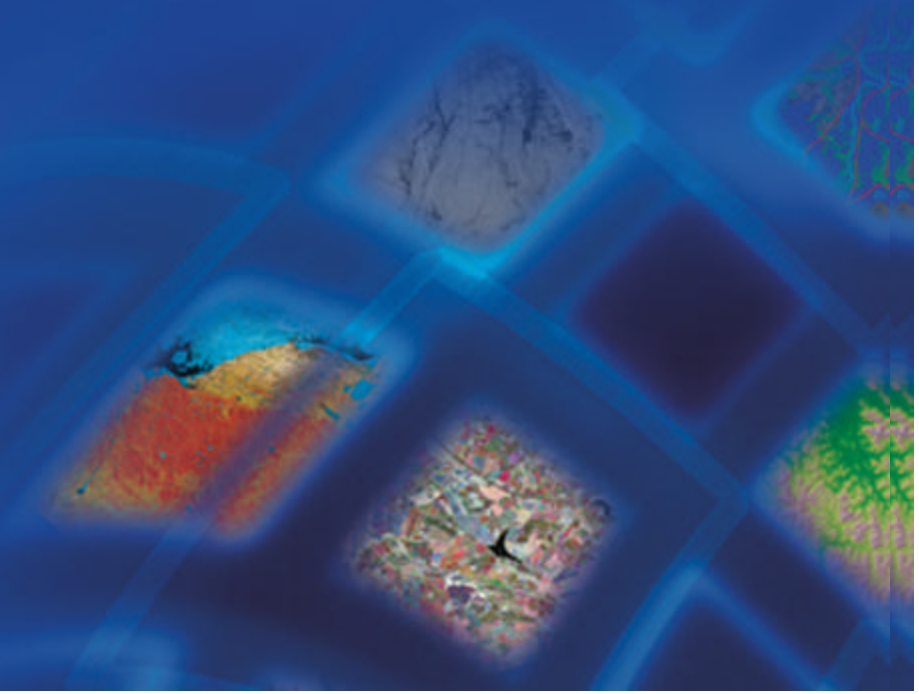
Stuart Jones, City of Richmond

Tor Henderson, RADARSAT International

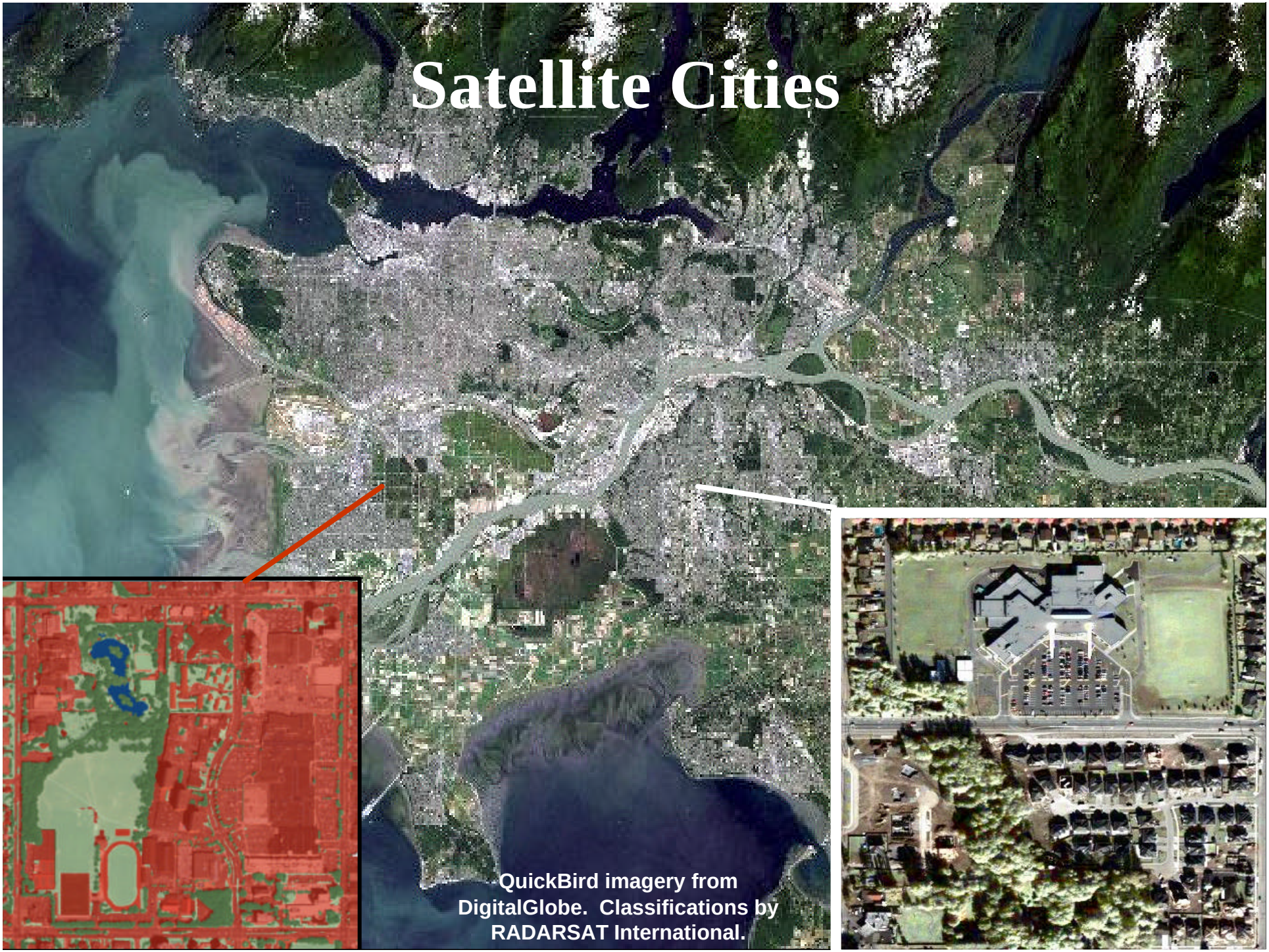
URISABC

Richmond, BC

February 2004



Satellite Cities



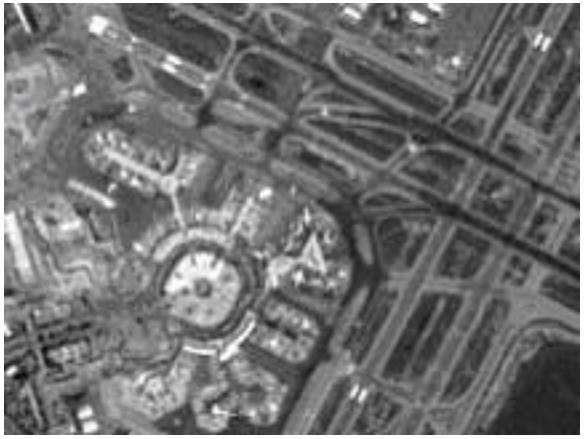
QuickBird imagery from DigitalGlobe. Classifications by RADARSAT International.

- High-Resolution Satellites
- More Than Just A Pretty Picture
- Urban Applications
  - Impervious Surface Mapping
  - Urban Greenspace Mapping
  - Change Detection Mapping
- City of Richmond
- City of Surrey

RESOLUTION

SPOT

20 meter



IRS C

6 meter

IKONOS

1 meter

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High-Resolution Satellites

- Our definition - resolution 1.0m or better

Satellite	QuickBird	IKONOS	Orb-View 3
Owner	DigitalGlobe	Space Imaging	ORBIMAGE
Launch Date	October 2001	September 1999	June 2003
Resolution	60cm pan	1.0m pan	1.0m pan
Resolution	2.44m multispectral	4.0m multispectral	4.0m multispectral
Scene Size	16.5 x 16.5 km	11 x 11 km	8 x 8 km
Price	$18 USD pr km^2	$7 USD pr km^2	TBD

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QuickBird

- 60-cm resolution
- World's highest resolution commercial satellite imagery available today

SAFECO FIELD
WELCOME TO
SEATTLE

More Than Just A Pretty Picture

1. Temporal Updating Benefit

   Satellite Imagery Allows for Cost-Effective Temporal Updating of Photobase

   - minimum order size starting at 25 km^2
   - prices starting at $7.00 USD per square kilometer for imagery

2. Multispectral Data

   Satellite imagery allows for Multispectral Analysis

Satellite Orthos Complement Aerial Ortho Imagery

- Main difference - resolution
  - Aerial can provide a very high resolution (e.g. 10 cm)
  - Satellite can currently provide maximum 60 cm resolution
- Main benefits of satellite imagery
  - **Allows for cost effective temporal updates of orthophoto base**
  - **Allows for automated extraction of thematic information through multispectral analysis**
  - Global access
  - Small to large area selections
  - No airspace restrictions
- Main limitations of satellite imagery
  - Cloud cover
  - Revisit time

Key Benefits

Multispectral Data Benefit

- Real value of imagery lies in information extraction
- Semi-automated extraction of information
- Inexpensive Land Cover Classifications
  - Impervious Surface Mapping
  - Urban Green Space Mapping
  - Change Detection Mapping

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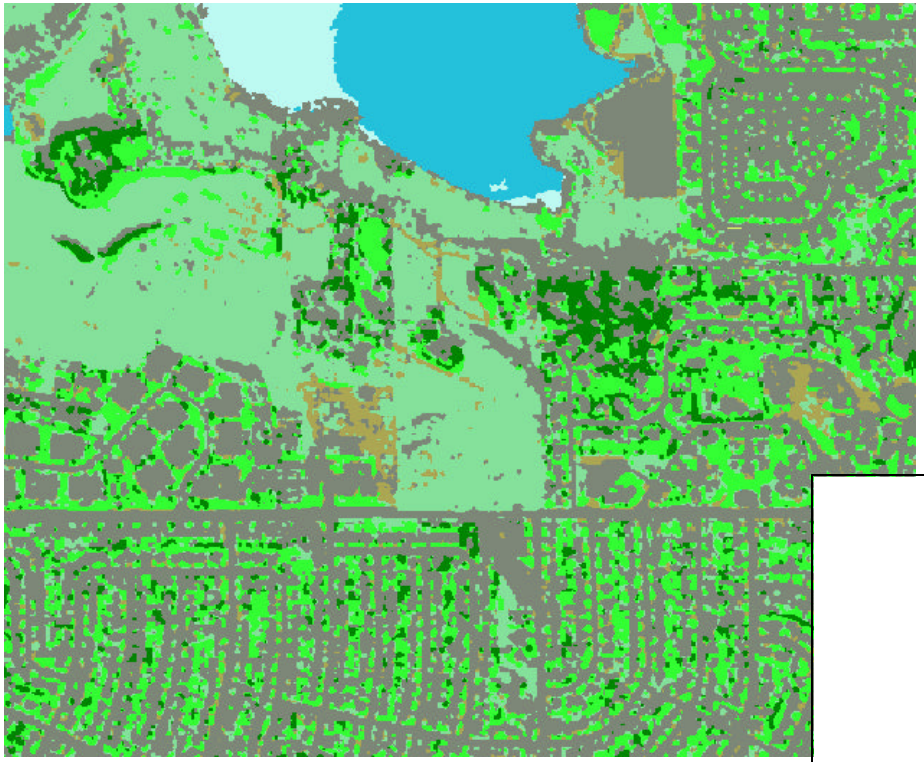
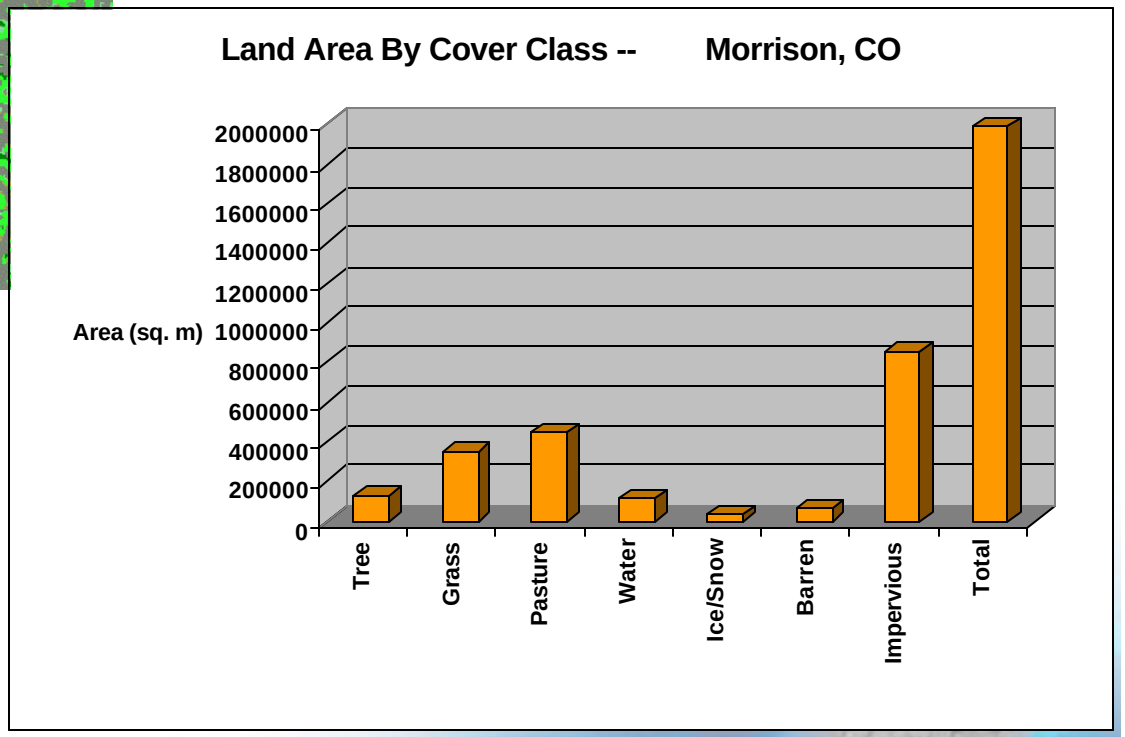
Satellite-Derived Land Cover Classifications

- Will support sound **decision making** in key areas such as:
  - **Greening Strategy Development**
  - **Parks Maintenance**
  - **Storm Water Management**
  - **Growth Management**
- The most cost-effective way in determining:
  - **total area of impervious surfaces in a city**
  - **total area of urban greenspace in a city**
- Cost-effective in monitoring change



- **Impervious Surface Mapping**
- **Urban Greenspace Mapping**



- **Change Detection Mapping**

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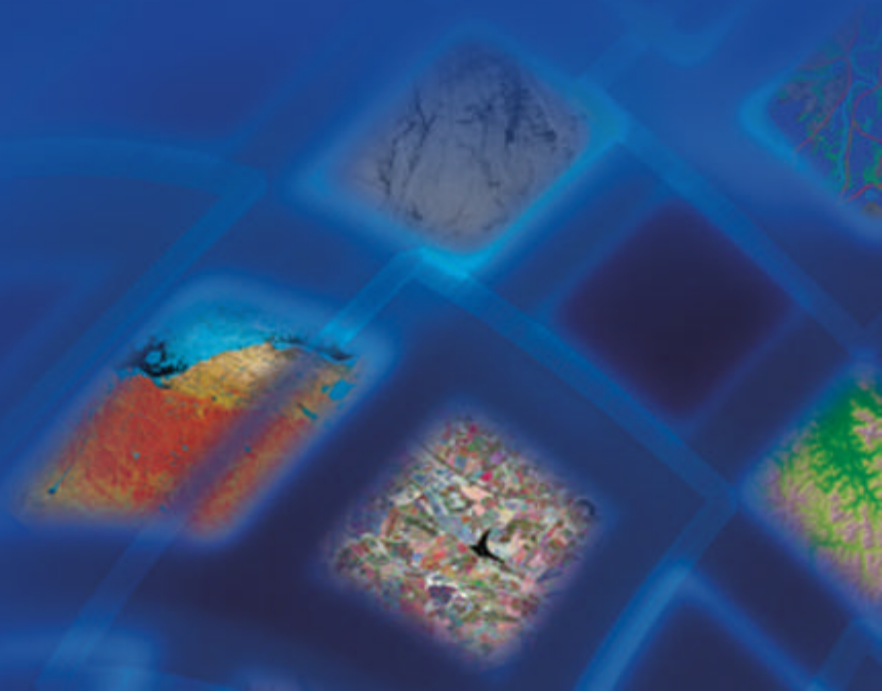
Impervious Surface Mapping

Land cover classification



Impervious Surface Mapping

Utilizing the spectral properties of QuickBird MS imagery, it is possible to determine total area of pervious versus impervious surfaces to assist in storm water management

Impervious Surfaces:

- Usually includes building rooftops, roads, sidewalks, and all other paved areas.

Classification at Two Resolutions:

Alternative 1:

2.4m - 2.8m resolution

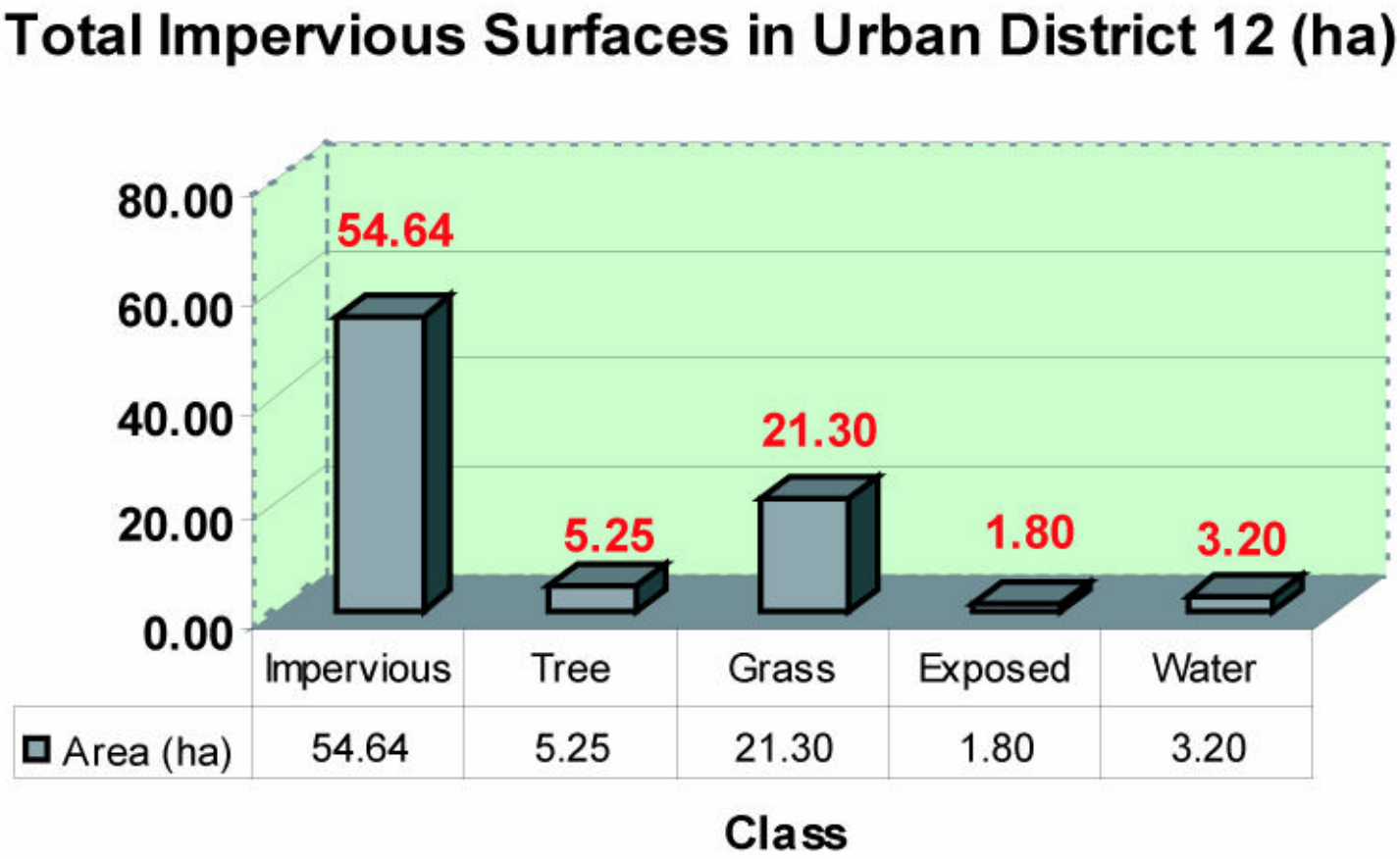
- for aggregate studies concerning hydrological modeling, down to the catchment level.

Alternative 2:

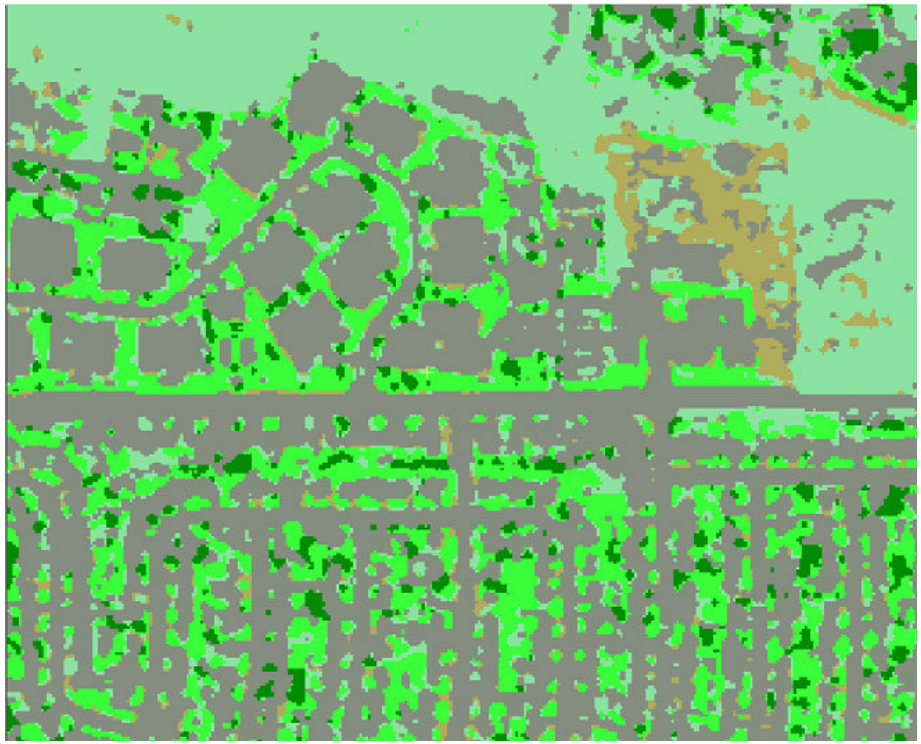
60cm - 70cm resolution

- suitable for analysis at the residential parcel level

Extract Impervious Information from a Geographic Area



Decision Support Tool



- Determine total AREA of impervious surfaces
- Increase Tax Revenues:
  - Stormwater tax- impervious/pervious surfaces
  - Revised assessments- construction without permit,...
- Address needed water system improvements
- Perform modeling scenarios on water runoff
- Controlled Growth Management

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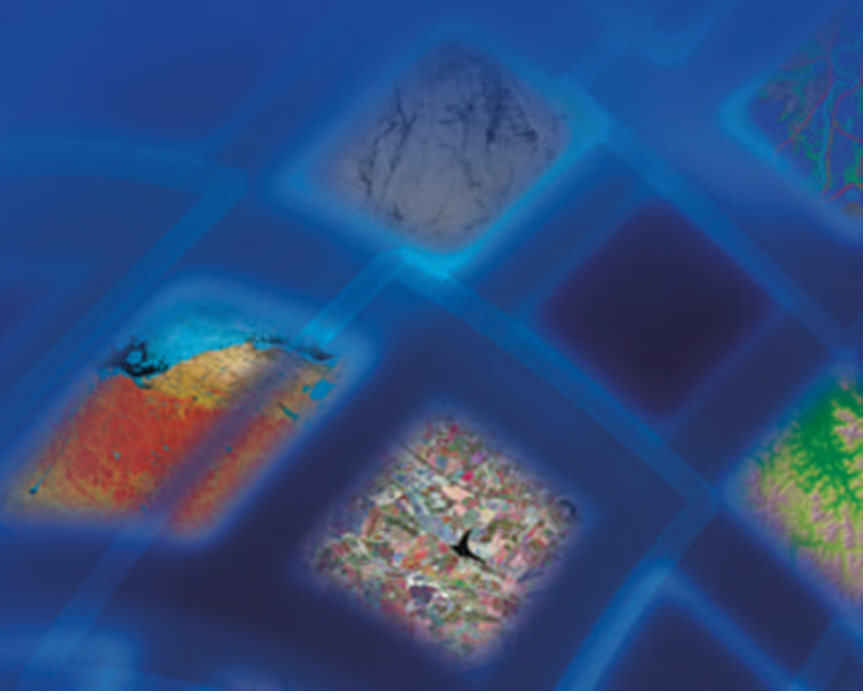
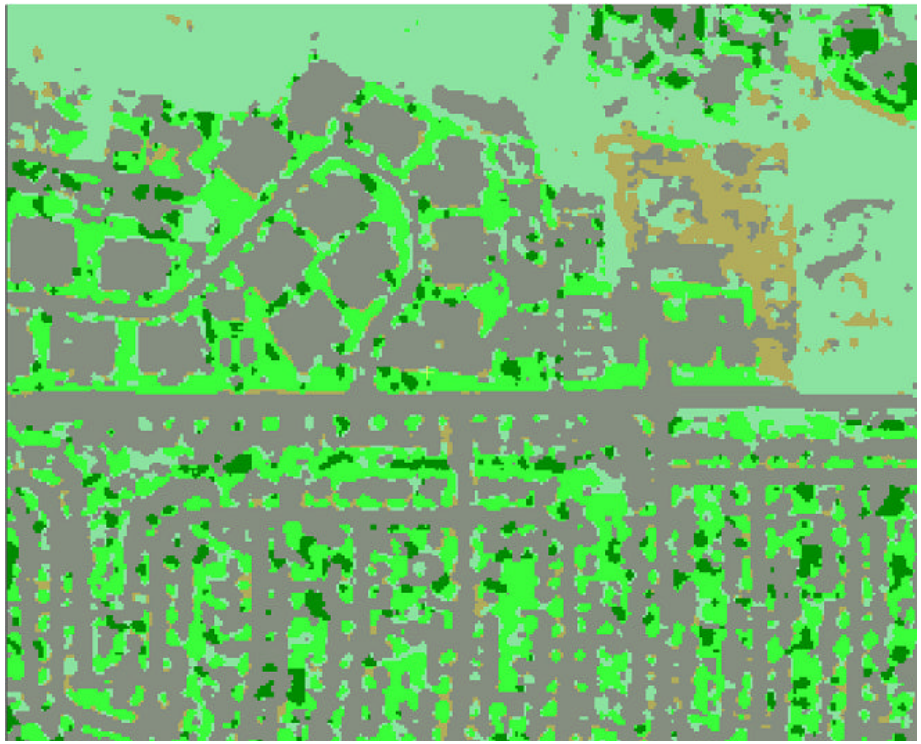
Urban Green Space Mapping

Land cover classification



Powerful Decision-Support Tool for Sustainable Planning



- Greening Strategy Development
- Effective decisions can be made regarding:
  - the demand for greenspace
  - the demand for trees to address improved air quality
  - park maintenance
- Controlled Growth Management

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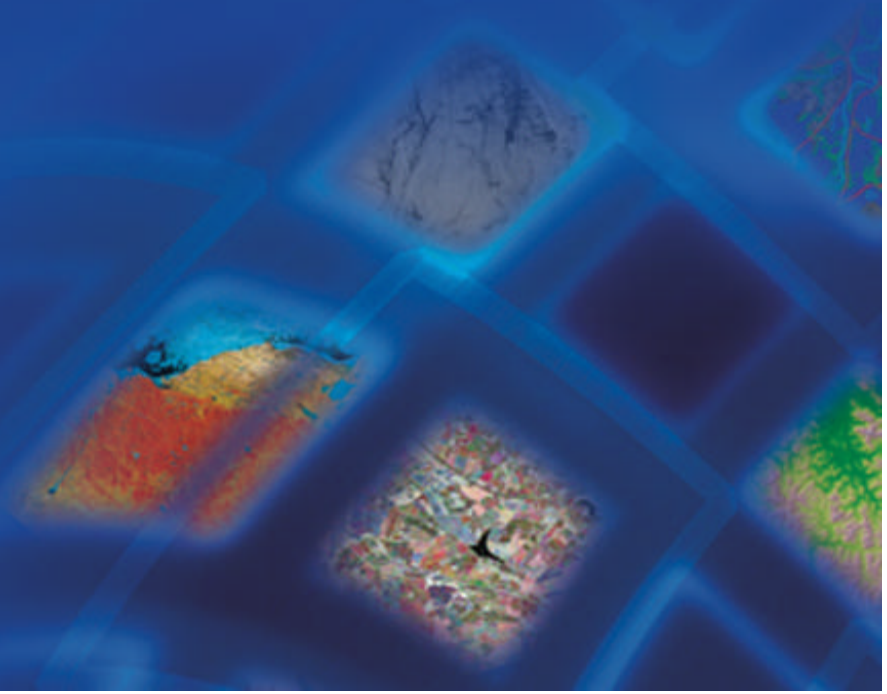
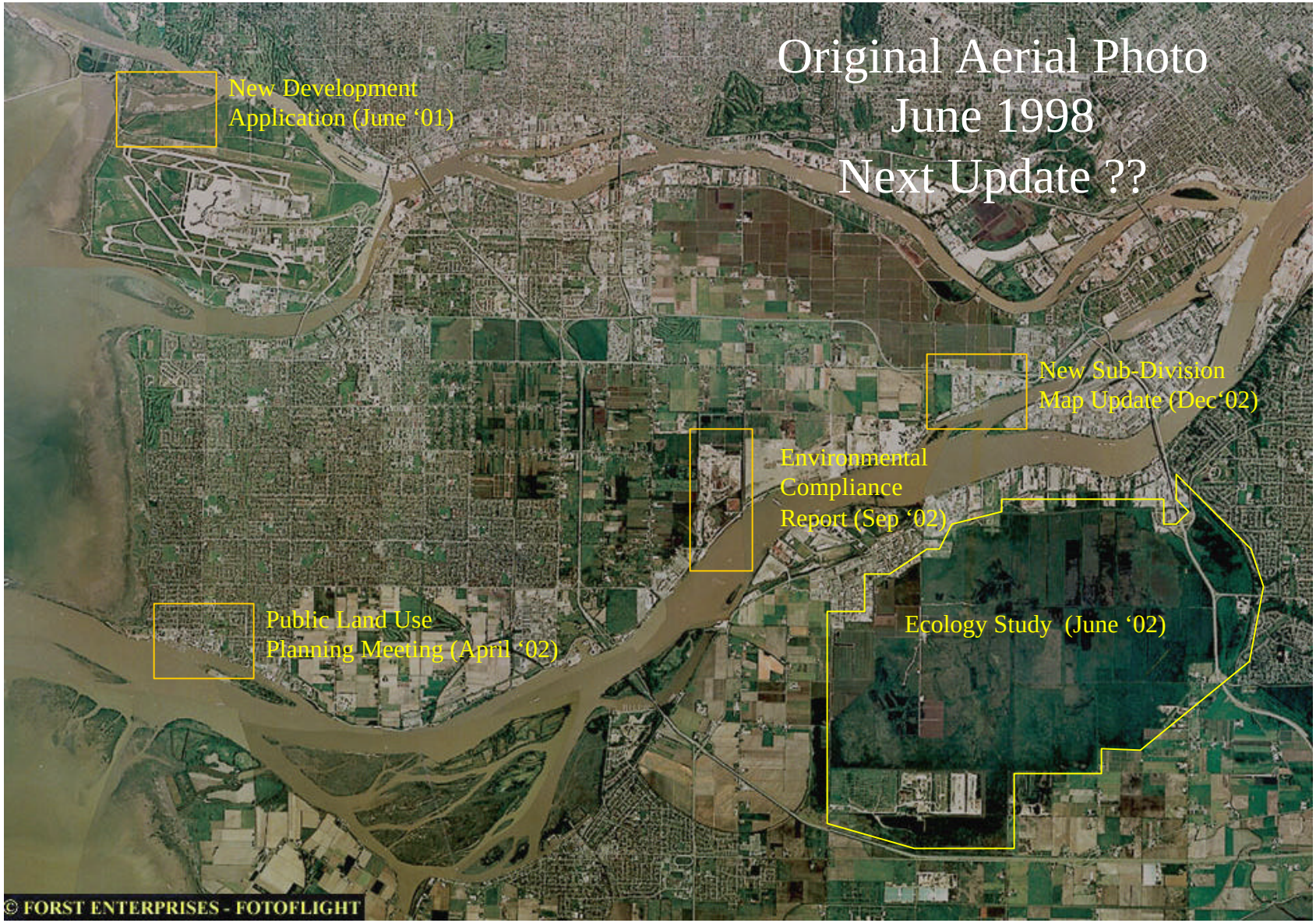
Change Detection Mapping

Work with timely updates



A New Paradigm For Information Update



Change Detection Mapping Service (Subscription Service)

Year	Image Source	Resolution
1	Aerial Orthos	<60cm
2	Satellite Orthos	60cm
3	Satellite Orthos	60cm
4	Aerial Orthos	<60cm
5	Satellite Orthos	60cm
6	Satellite Orthos	60cm

Satellite orthos are 100% digital, less expensive depending on size of area and include infra-red data.

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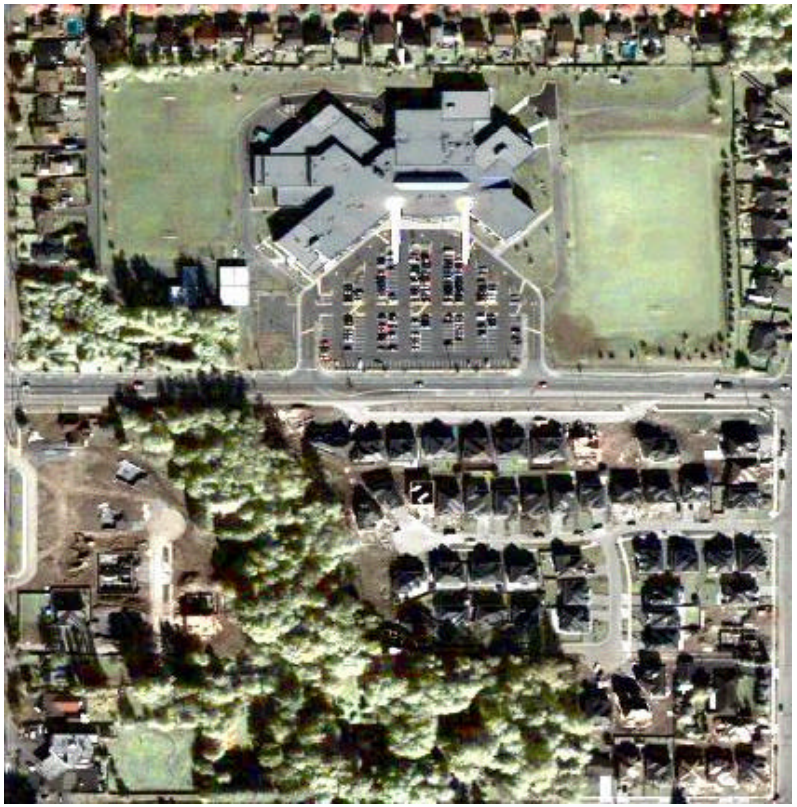
Change Detection

Aerial Image: City of Surrey 2001
(Image courtesy City of Surrey)



Satellite Image: City of Surrey 2002

Map Change

- Develop machine pattern recognition techniques for specific missions
- Design custom change detection algorithms with image processing software

Eg. Develop a program for change detection of new roads

- identify detailed areas of new development and new roads
- then prioritize acquisition of new data and road map updating

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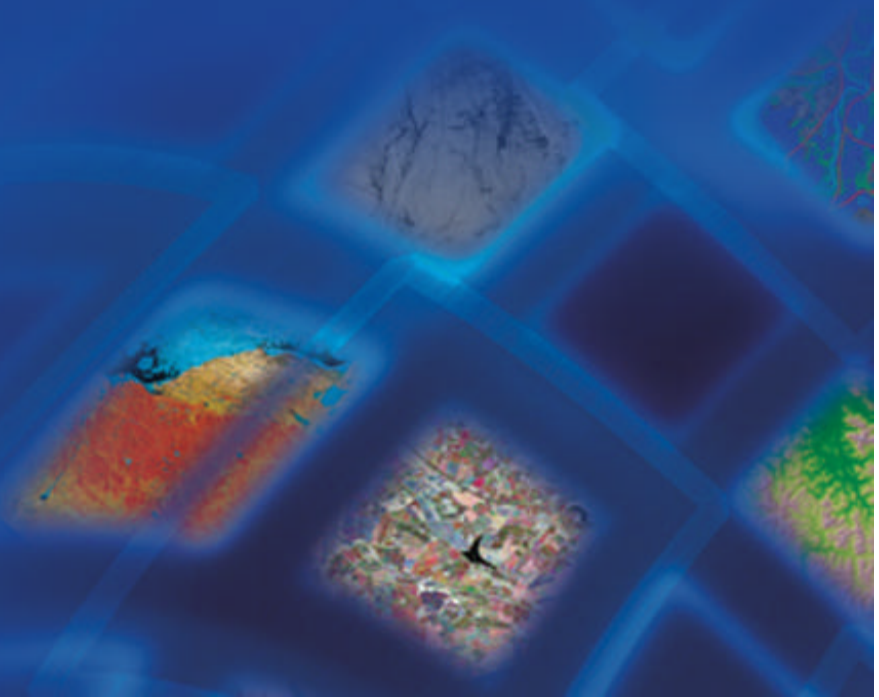
Future



Cost Sharing Initiatives:
Civil Government Licensing

ZERO % UPLIFT ON PRICE OF DATA

Includes up to 10 civil government organizations

User	Total Price	Price per user	Savings
City	$2,100	$2,100	**0%**
City & 9 other civil org's	$2,100	**$210**	**90%**

Prices (in $CAD) above are based on new acquisition of 64 sq. km of color 60cm standard satellite imagery

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Future

- Better resolution
- Increased competition
- Lower prices
- Increased re-visit times
- Classification (image interpretation) software is improving yielding greater accuracies (pixel based versus object orientated).