



## Minicurso

**“Uso de geotecnologias como ferramenta para projetos de intervenção ambiental”**

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## Resumo da Apresentação

- 1- Introdução (Antecedentes);
- 2- Objetivos do minicurso;
- 3- Problemas ambientais relacionados aos recursos hídricos;
- 4- Uso de geotecnologias para aplicações ambientais;
- 5- Conceitos básicos sobre geoprocessamento e SIG;
- 6- Proposta de trabalho para o CBH-Curu.

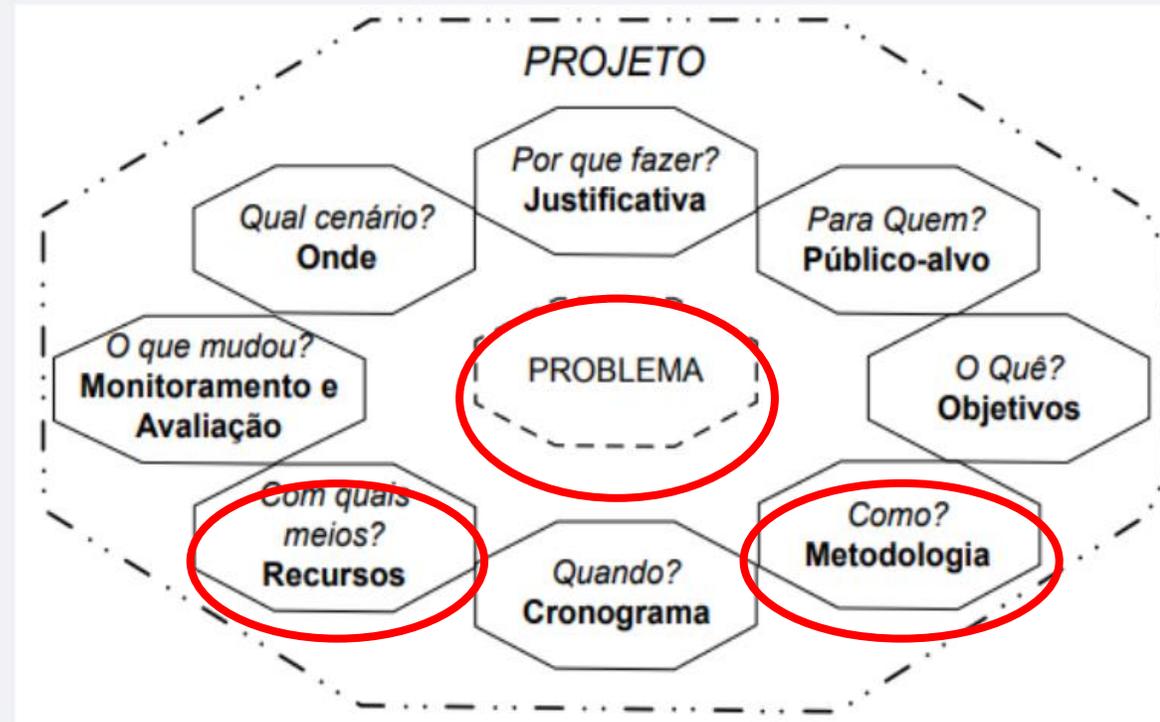


# Projetos de Intervenção Ambiental no Semiárido



# O que é um Projeto?

*O projeto descreve em detalhes: o problema a ser enfrentado; quem serão as pessoas envolvidas; o que se pretende fazer; como, onde e por quem será desenvolvido; quais serão os recursos necessários.*

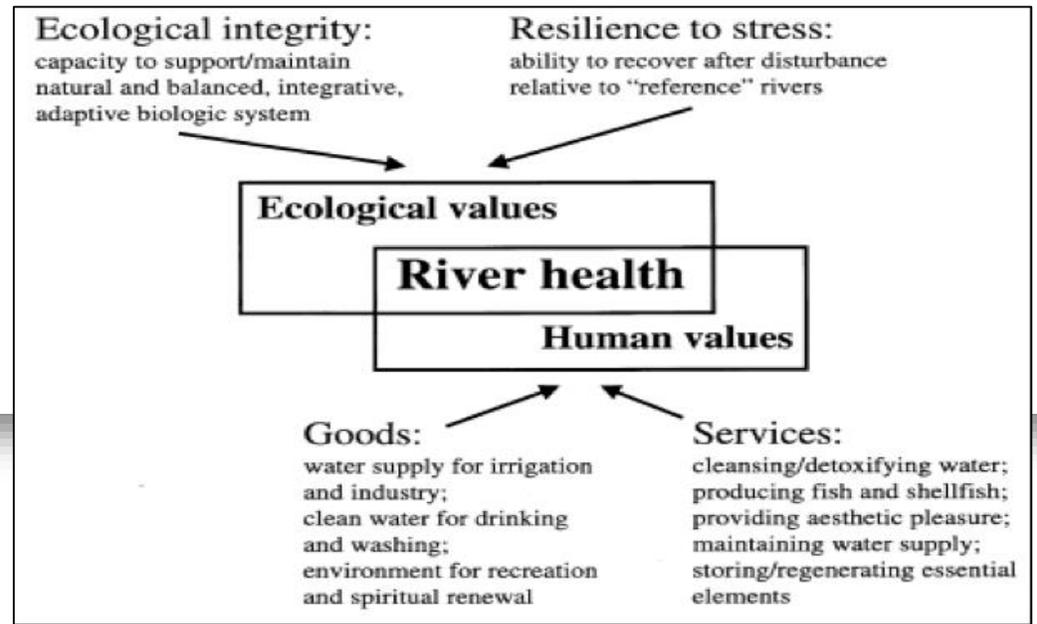
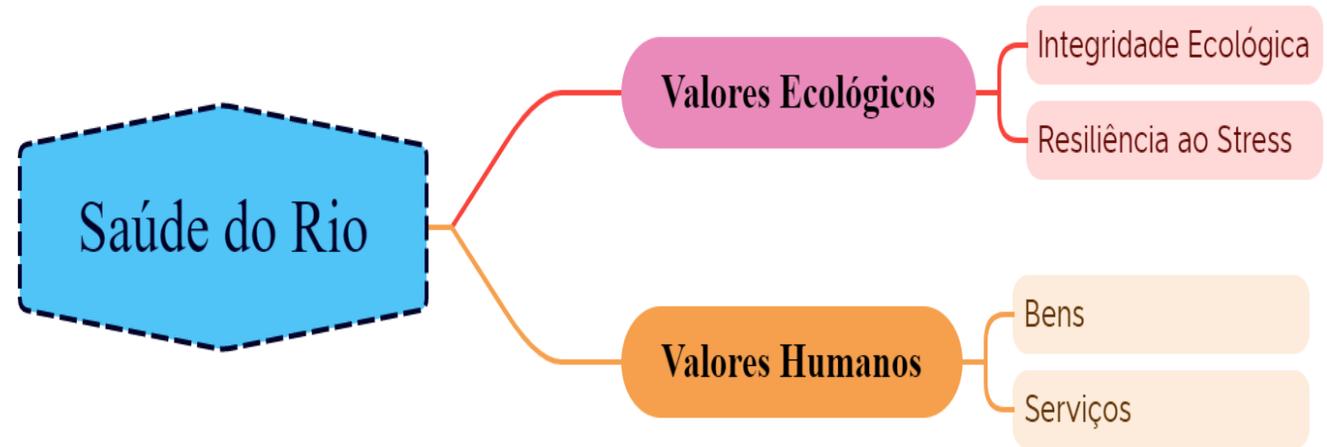
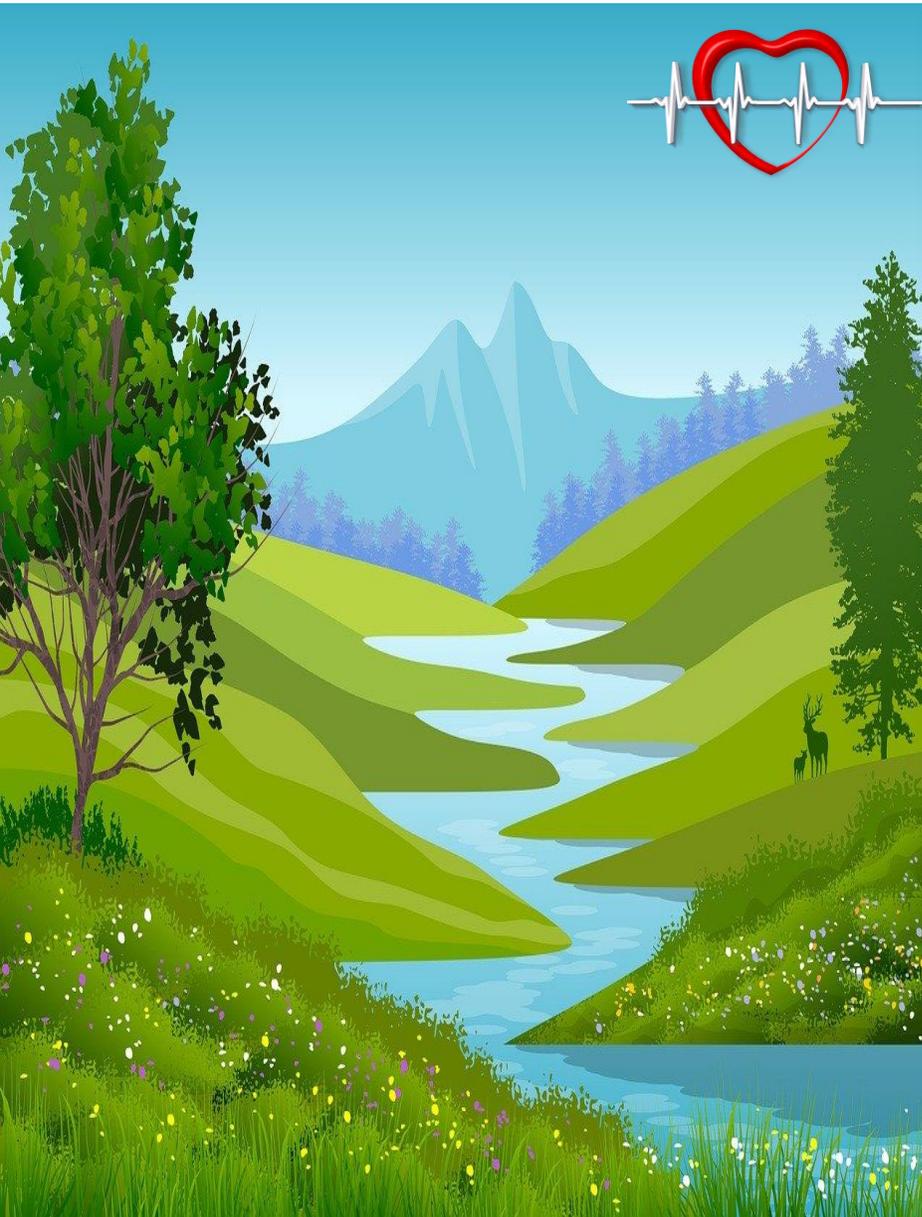


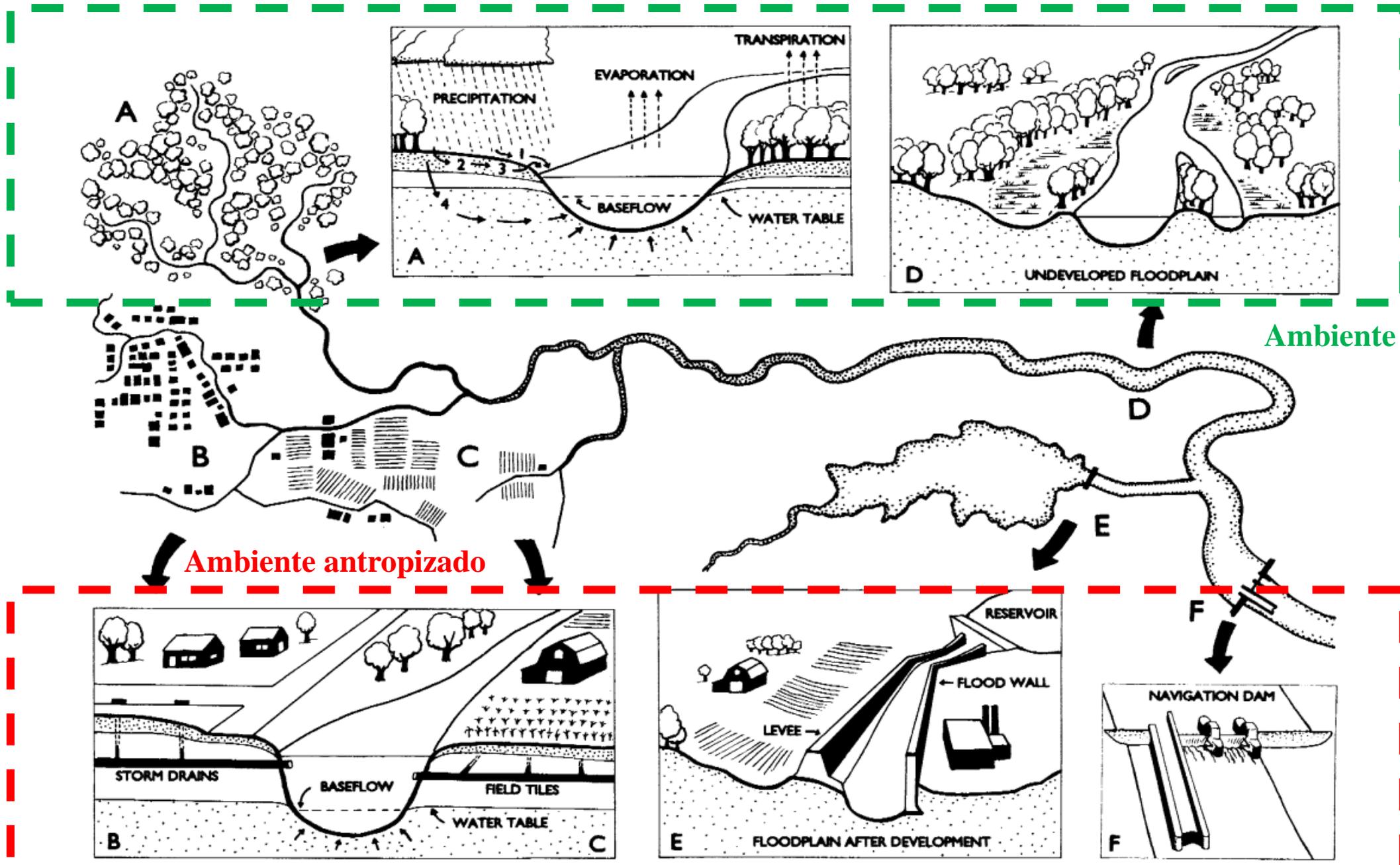


### Após este minicurso, você será capaz de:

- Identificar os principais problemas ambientais que ocorrem em uma bacia hidrográfica e seus efeitos sobre os recursos hídricos;
- Compreender conceitos básicos de geoprocessamento e de Sistema de Informação Geográfica (SIG);
- Coletar e armazenar dados ambientais georreferenciados por meio de geotecnologias de livre acesso (Softwares/Aplicativos gratuitos);
- **Contribuir com CBH-Curu em seu município;**

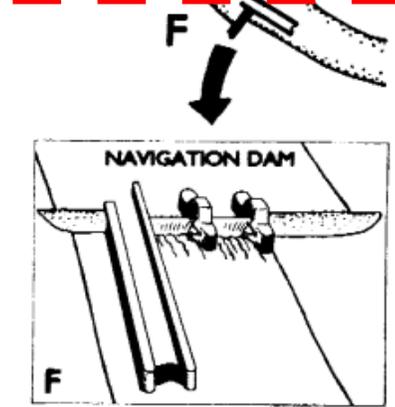
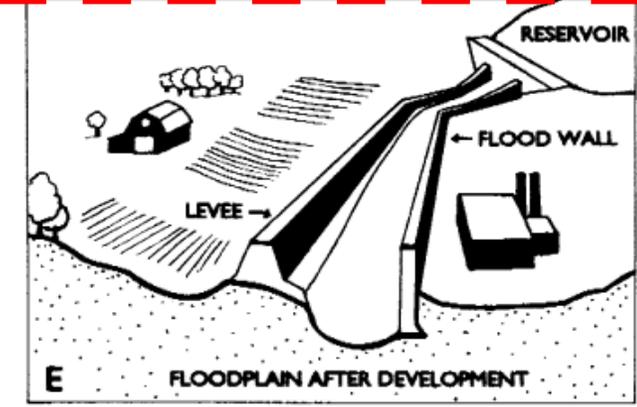
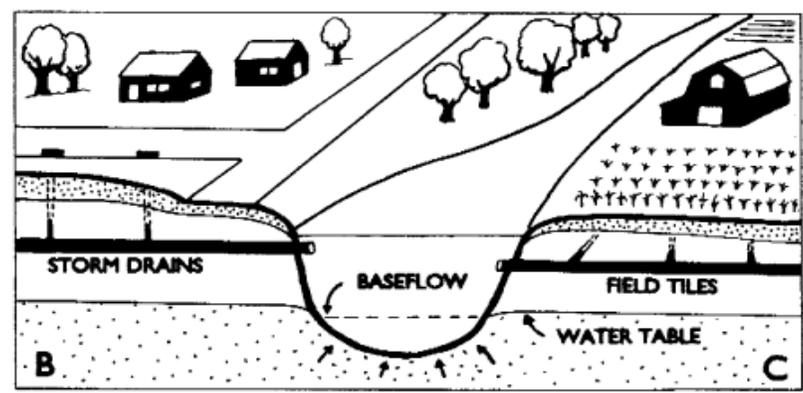
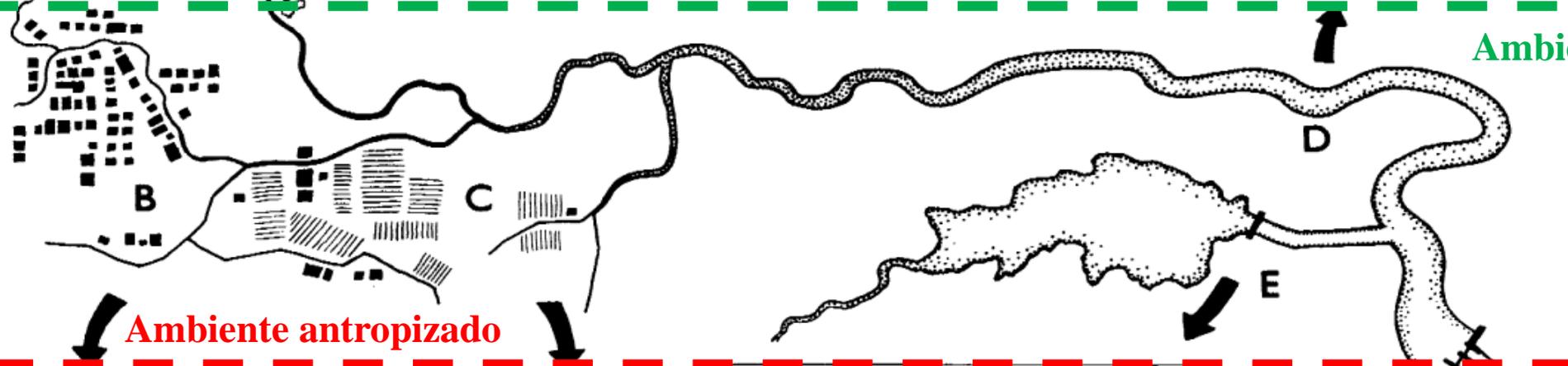
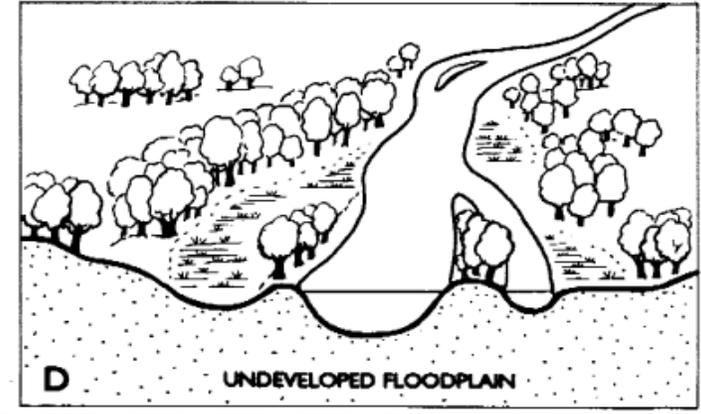
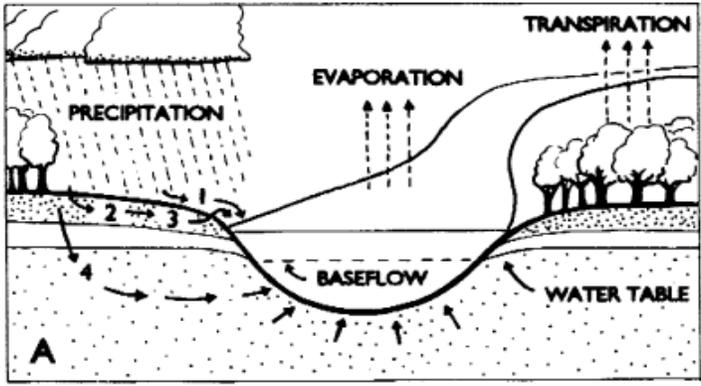
### Assimilando o conceito de saúde dos rios.....





Ambiente natural

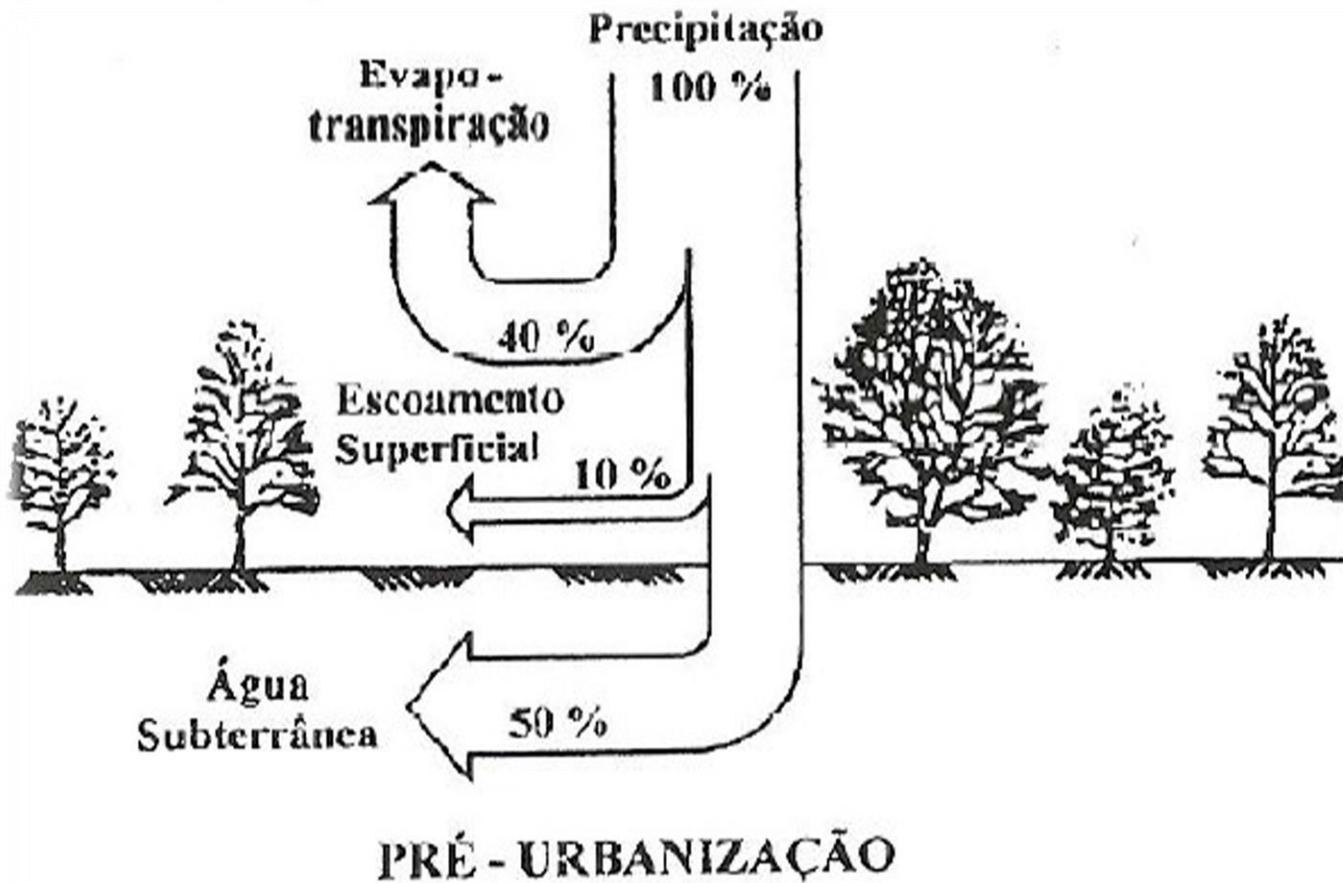
Ambiente antropizado



# Características de bacias hidrográficas naturais, rurais e urbanas



## Bacias Naturais



-Em condições naturais, grande parte do volume de chuva que entra em uma bacia é retido por processos de interceptação, infiltração, evaporação;

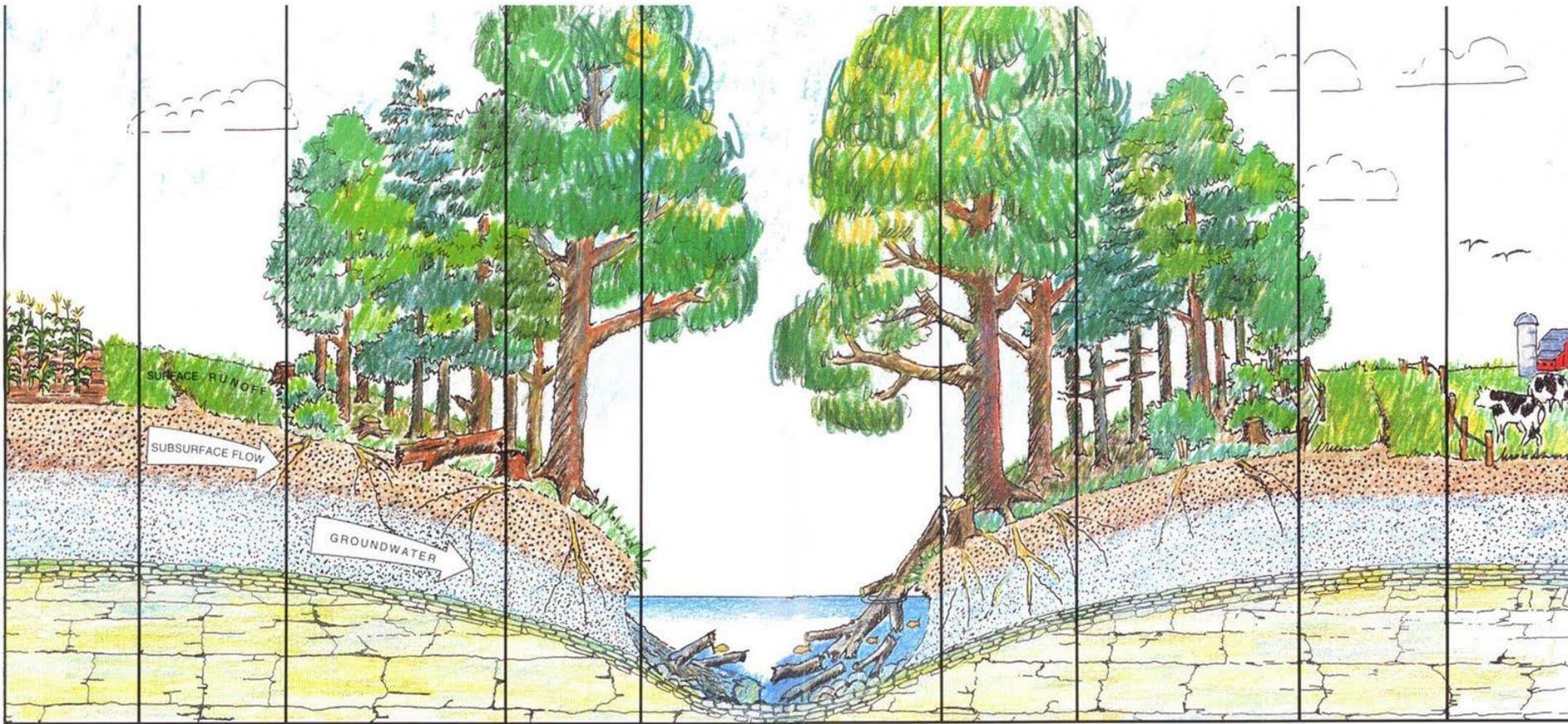
-Em áreas de mata, o solo apresenta baixo grau de compactação, o que resulta em uma maior taxa de infiltração.

## Bacias Rurais



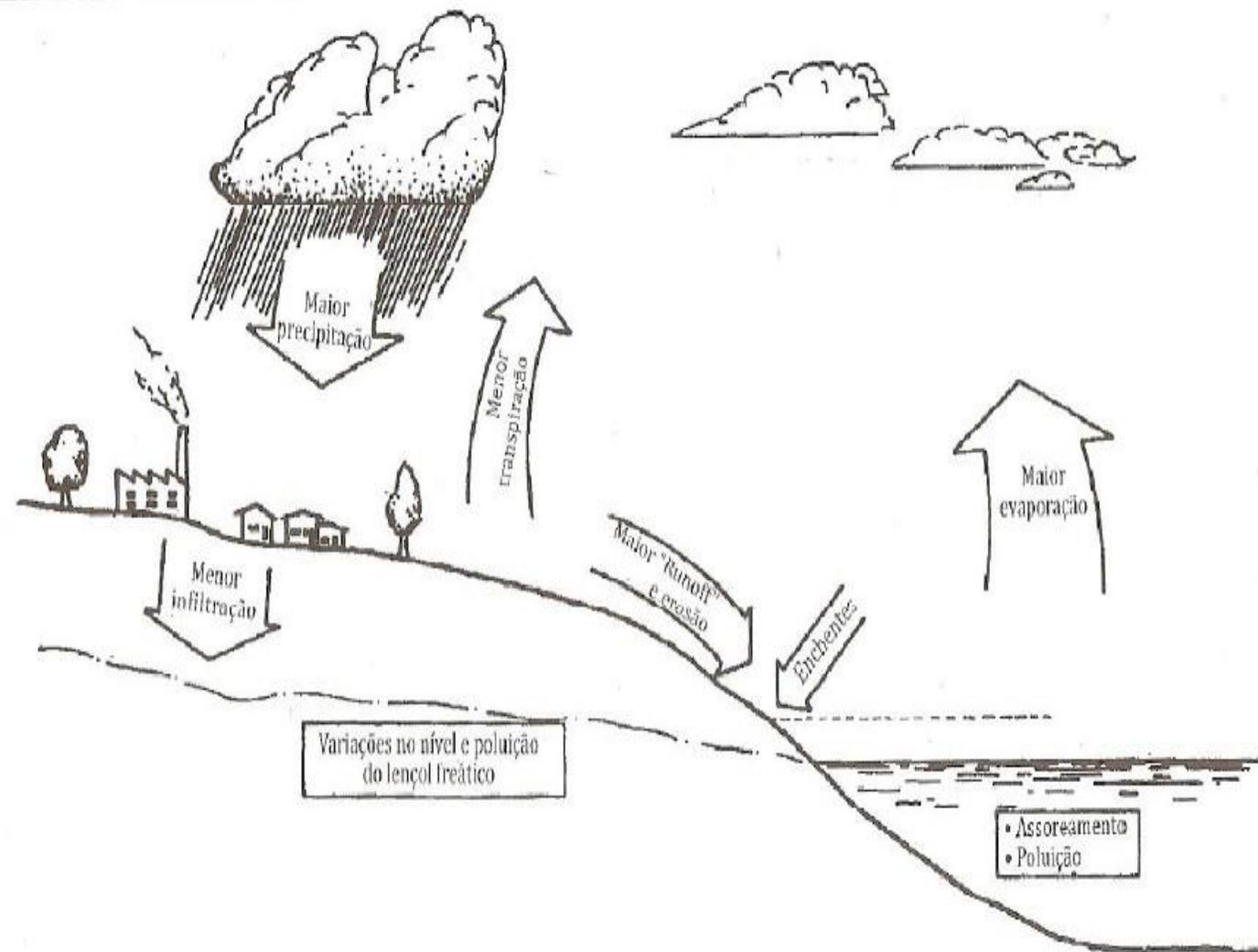
- As bacias em áreas rurais apresentam extensas áreas de cultivo ou pastagens e podem mostrar alterações na qualidade das águas e nos regimes de escoamento em função da alteração da cobertura vegetal;
- O solo exposto aumenta as perdas por evaporação direta, gerando perda excessiva de umidade dos solos e eventual necessidade de irrigação (TUDIZINI, 2006);

# Bacias Rurais



	20'	60'	15'		15'	60'	20'	
<b>CROPLAND</b>	<b>ZONE 3 RUNOFF CONTROL</b>	<b>ZONE 2 MANAGED FOREST</b>	<b>ZONE 1 UNDISTURBED FOREST</b>	<b>STREAM BOTTOM</b>	<b>ZONE 1 UNDISTURBED FOREST</b>	<b>ZONE 2 MANAGED FOREST</b>	<b>ZONE 3 RUNOFF CONTROL</b>	<b>PASTURE</b>
Sediment, fertilizer and pesticides are carefully managed.	Concentrated flows are converted to dispersed flows by water bars or spreaders, facilitating ground contact and infiltration.	Filtration, deposition, plant uptake, anaerobic denitrification and other natural processes remove sediment and nutrients from runoff and subsurface flows.	Maturing trees provide detritus to the stream and help maintain lower water temperature vital to fish habitat.	Debris dams hold detritus for processing by aquatic fauna and provide cover and cooling shade for fish and other stream dwellers.	Tree removal is generally not permitted in this zone.	Periodic harvesting is necessary in Zone 2 to remove nutrients sequestered in tree stems and branches and to maintain nutrient uptake through vigorous tree growth.	Controlled grazing or haying can be permitted in Zone 3 under certain conditions.	Watering facilities and livestock are kept out of the Riparian Zone insofar as practicable.

## Bacias Urbanas



### 1-Alterações no aspecto quantitativo:

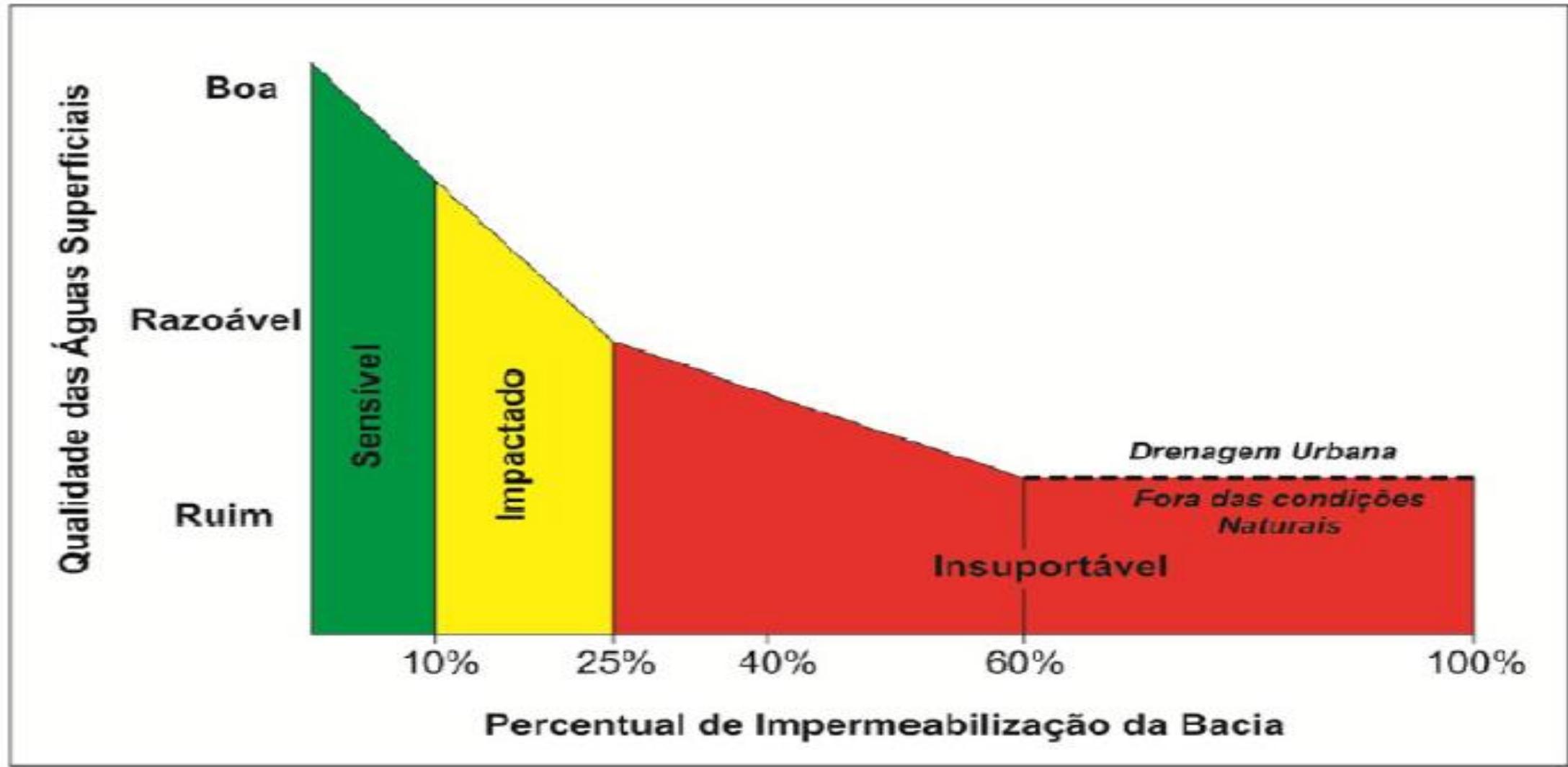
Geralmente estão associadas ao processo de impermeabilização do solo através de pavimentos, telhados, calçadas;

### 2-Alterações no aspecto qualitativo:

Estão associadas ao aumento da geração de esgotos domésticos, aumento da atividade industrial e da poluição por ela gerada, bem como aumento dos resíduos sólidos urbanos e industriais.

### Bacias Urbanas

Figura 15 – Qualidade







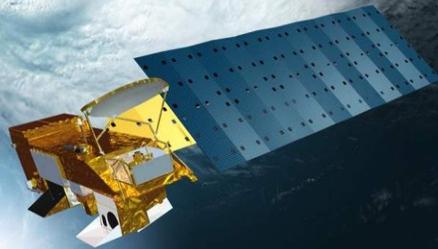
# SATÉLITES

National Aeronautics and Space Administration

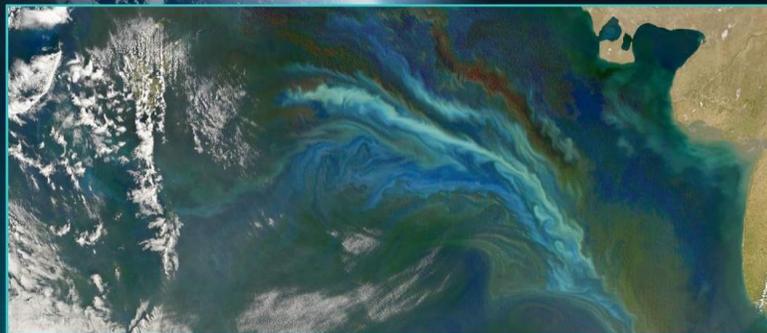


# Aqua

Aqua is a multi-national scientific research satellite collecting data on a wide-range of atmospheric, land, and ocean variables and processes, including the precipitation, evaporation, and cycling of water.



Launch: Delta II Rocket – May 4, 2002

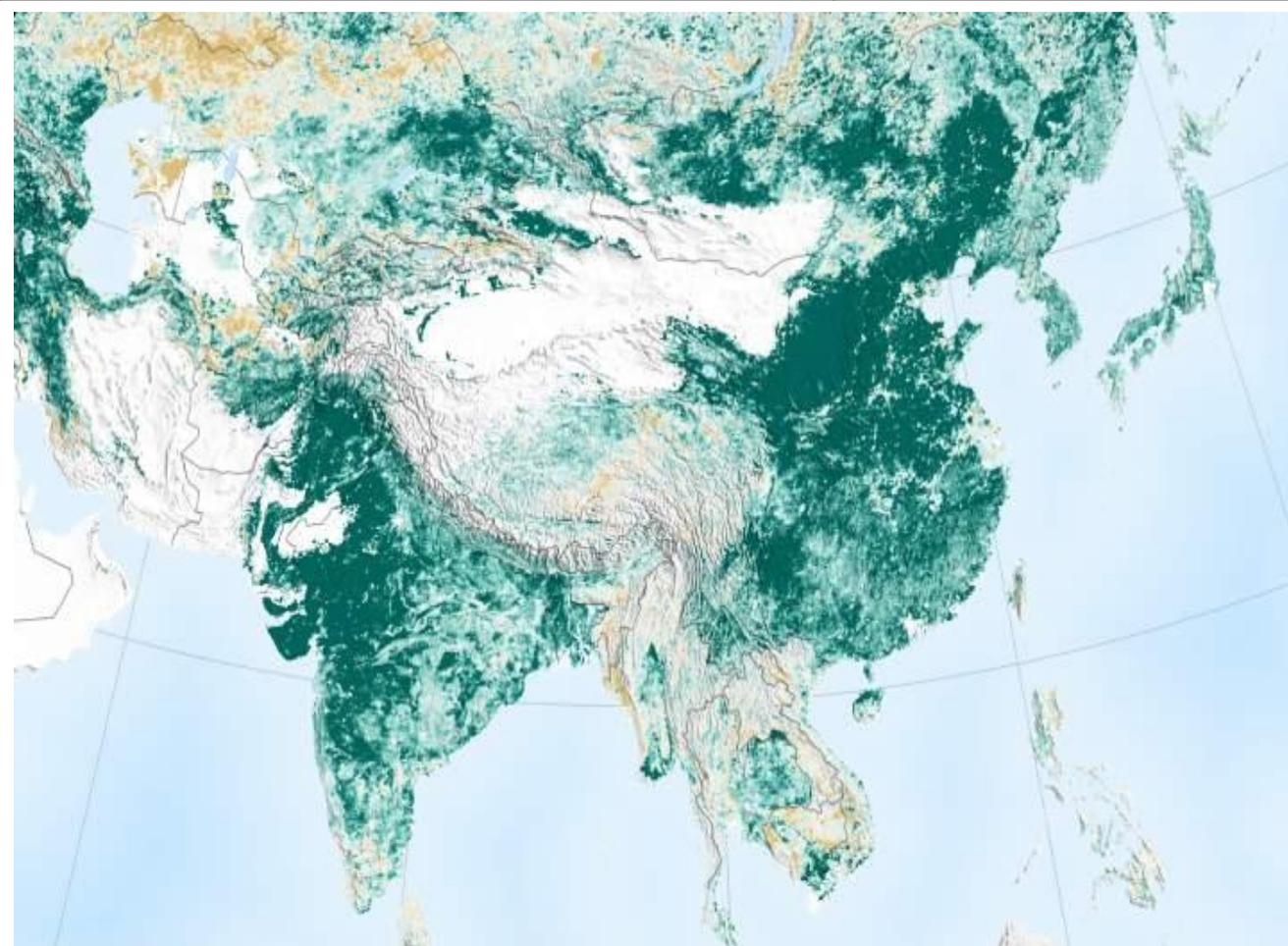


Phytoplankton blooming off the Atlantic Coast – December 21, 2010

[www.nasa.gov](http://www.nasa.gov)

## Áreas de Aplicação

- Qualidade do ar;
- Desastres ambientais;
- Cobertura da terra;
- Recursos hídricos;



Trend in Annual Average Leaf Area (% per decade, 2000-2017)



-Monitoramento de programas de plantio de árvores e intensificação da agricultura.

NASA Earth Observatory images by Joshua Stevens, using data courtesy of [Chen et al.,\(2019\)](#).



# CALIPSO

Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation

Observing the vertical structure of clouds and aerosol layers



Launch: Delta II - April 28, 2006  
www.nasa.gov



CALIPSO watches Eyjafjallajökull's plume drift over northern Europe - April 17, 2010

## Áreas de Aplicação

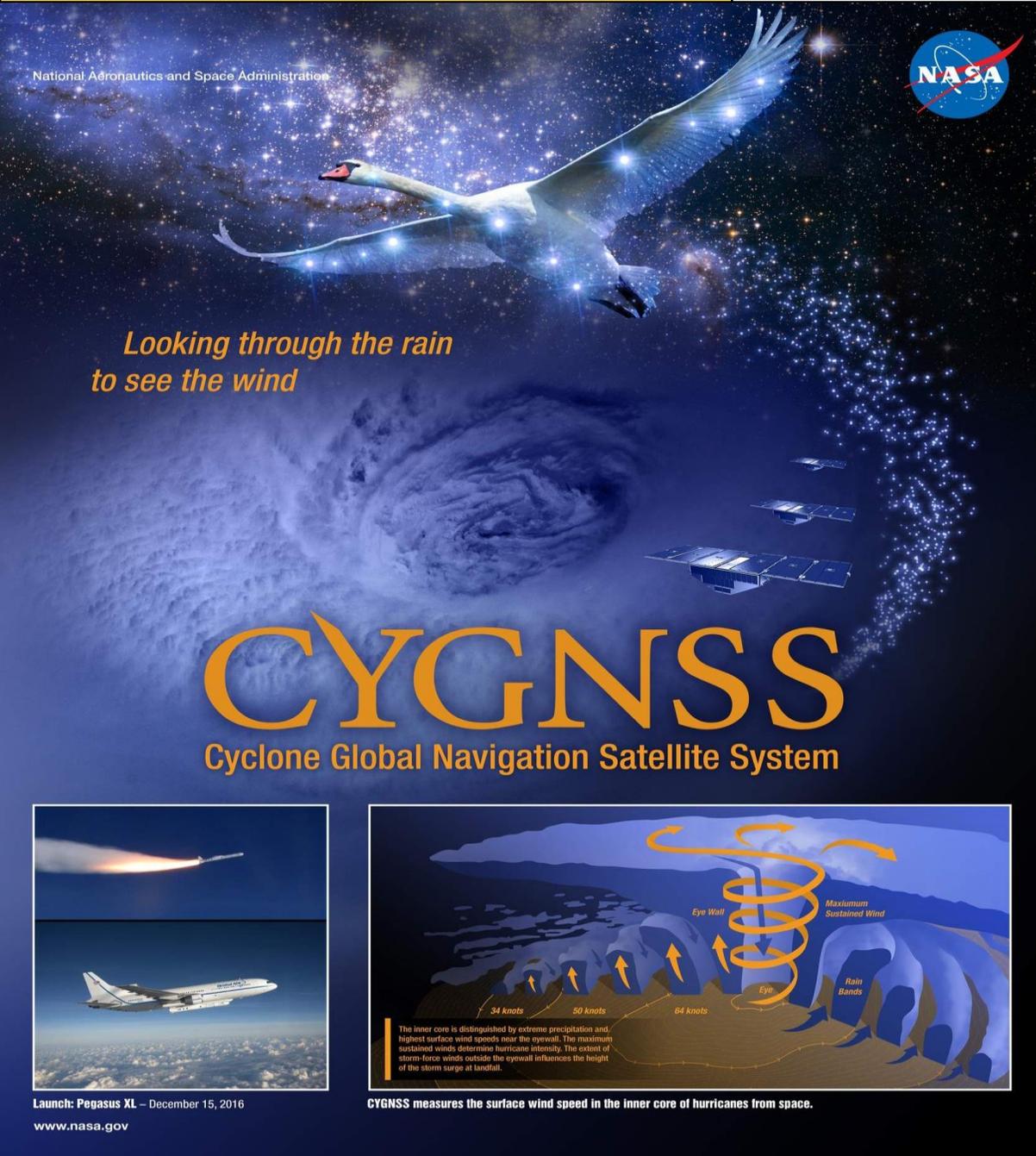
-Qualidade do ar;

Fumaça oriunda de incêndio



Total Attenuated Backscatter ( $\times 10^{-3}/\text{km}/\text{sr}$ )





National Aeronautics and Space Administration

NASA

*Looking through the rain to see the wind*

# CYGNSS

Cyclone Global Navigation Satellite System

Launch: Pegasus XL – December 15, 2016  
www.nasa.gov

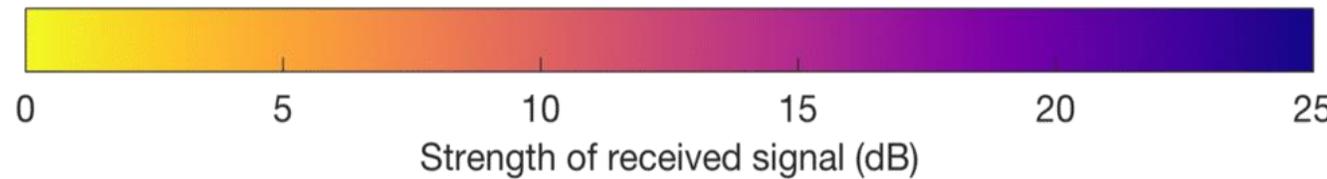
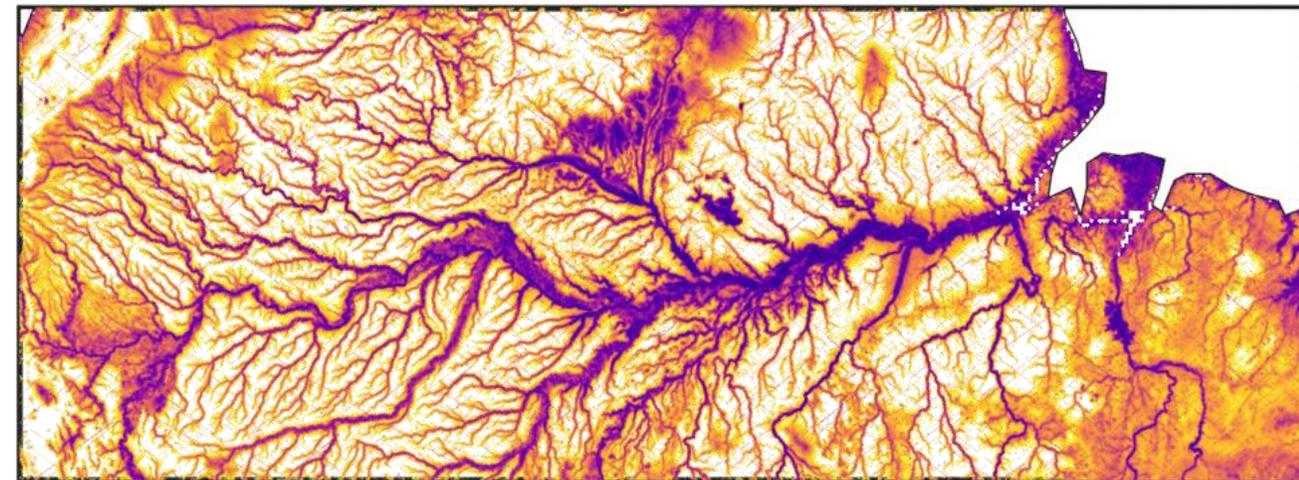
CYGNSS measures the surface wind speed in the inner core of hurricanes from space.

Diagram labels: Eye Wall, Maximum Sustained Wind, Rain Bands, Eye, 34 knots, 50 knots, 64 knots.

Text: The inner core is distinguished by extreme precipitation and highest surface wind speeds near the eyewall. The maximum sustained winds determine hurricane intensity. The extent of storm-force winds outside the eyewall influences the height of the storm surge at landfall.

## Áreas de Aplicação

- Desastres ambientais;
- Recursos hídricos;
- Mapeamento de inundações e áreas úmidas;



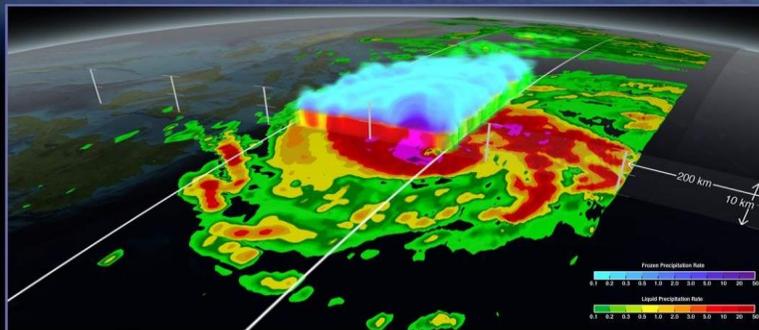
CYGNSS data delineates the streams and tributaries across the Amazon basin in South America (2018). Credits: [Clara Chew](#)

## Áreas de Aplicação

- Desastres ambientais;
- Estimativa de precipitação;
- Recursos hídricos;



Launch: HII-A Rocket – February 27, 2014  
www.nasa.gov



Super Typhoon Hagupit from the GPM Microwave Imager (surface map) and Dual-frequency Precipitation Radar (3-D data) aboard the GPM Core Observatory – December 5, 2014



# Landsat 8

Landsat Data Continuity Mission (LDCM)



*Continuing the record of the Earth's continental surfaces as seen from space*

## Áreas de Aplicação

- Qualidade do ar;
- Desastres ambientais;
- Cobertura da terra;
- Recursos hídricos;

# Landsat 7

Continuing the data record of the Earth's land cover



Launch: Delta II - April 15, 1999

www.nasa.gov



Meandering Mississippi - May 28, 2003



Lenda Delta - September 22, 2002

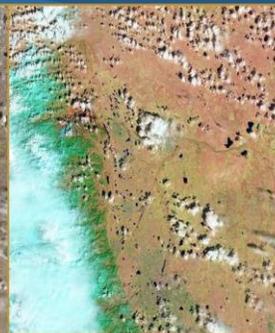


Launch: Atlas V Rocket - February 11, 2013

www.nasa.gov



Colorado, Operational Land Imager (OLI) - March 18, 2013



Colorado, Thermal Infrared Sensor (TIRS) - March 18, 2013



The top image shows the Mississippi River, near Memphis, TN, under typical winter conditions on Feb 27, 2014. The bottom image shows flooding, acquired Feb 25, 2019. **Landsat 8**, Source: [Earth Observatory](#)

Images show the Padma River in 1988, 1992, and 2018. The images were acquired by Landsat satellites: **Landsat 5**, **Landsat 7**, and the **Landsat 8**. Source: [Earth Observatory](#)

Is the ground dusty or muddy? Is it frozen?

NASA

# SMAP

Soil Moisture Active Passive

For 3 years, every 3 days, 1 instrument provides global measurements of soil moisture and its freeze/thaw state.

Launch: Delta II - January 31, 2015  
www.nasa.gov

Water content in the top 2 inches of soil - wetter areas are blue and drier areas are yellow.

Apr 22, 2015

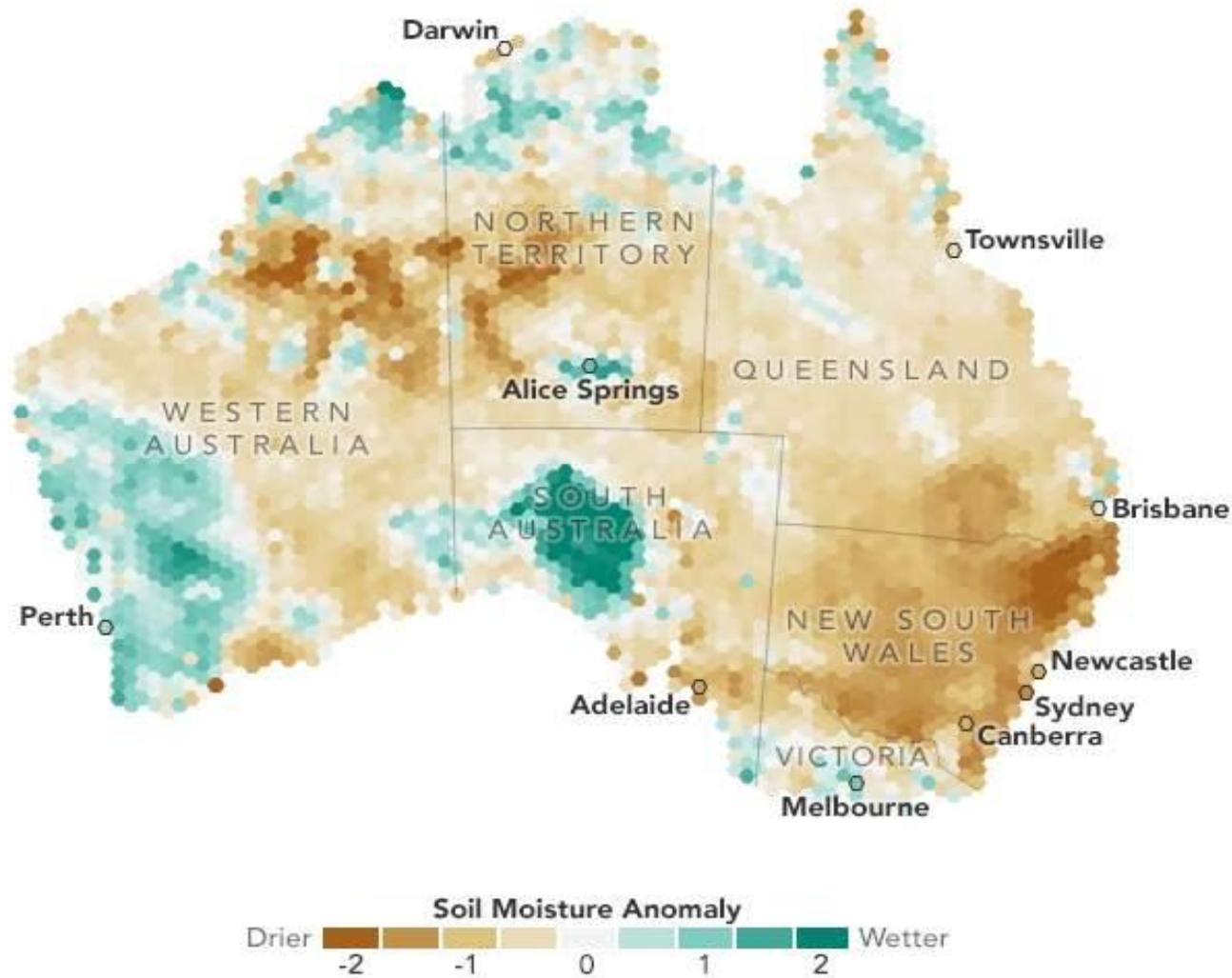
Soil Moisture (cm<sup>3</sup>/cm<sup>3</sup>)

0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60 0.65

The image features a NASA satellite in orbit, emitting a beam towards a field of corn. A world map below shows soil moisture levels as of April 22, 2015, with a color scale from 0.00 (yellow) to 0.65 (blue). A small inset shows the satellite's launch on a Delta II rocket.

## Áreas de Aplicação

- Qualidade do ar;
- Desastres ambientais;
- Cobertura da terra;
- Recursos hídricos;



- Estimativa de umidade contida no solo;
- Monitoramento de secas.

The map is derived from data collected by the Soil Moisture Active Passive (SMAP) mission, the first NASA satellite dedicated to measuring the water content of soils. Source: [EarthObservatory](https://earthobservatory.nasa.gov/)

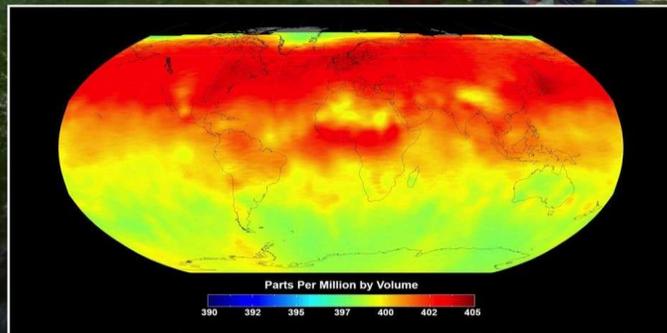
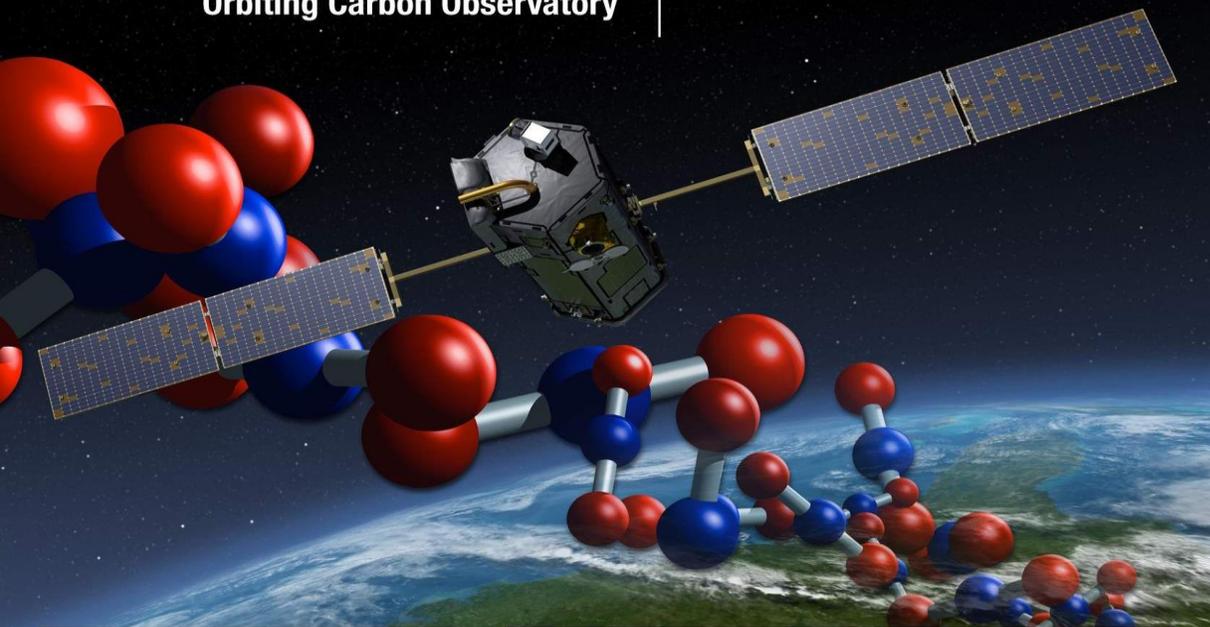
National Aeronautics and Space Administration



# OCO-2

Orbiting Carbon Observatory

*Watching the Earth Breathe*

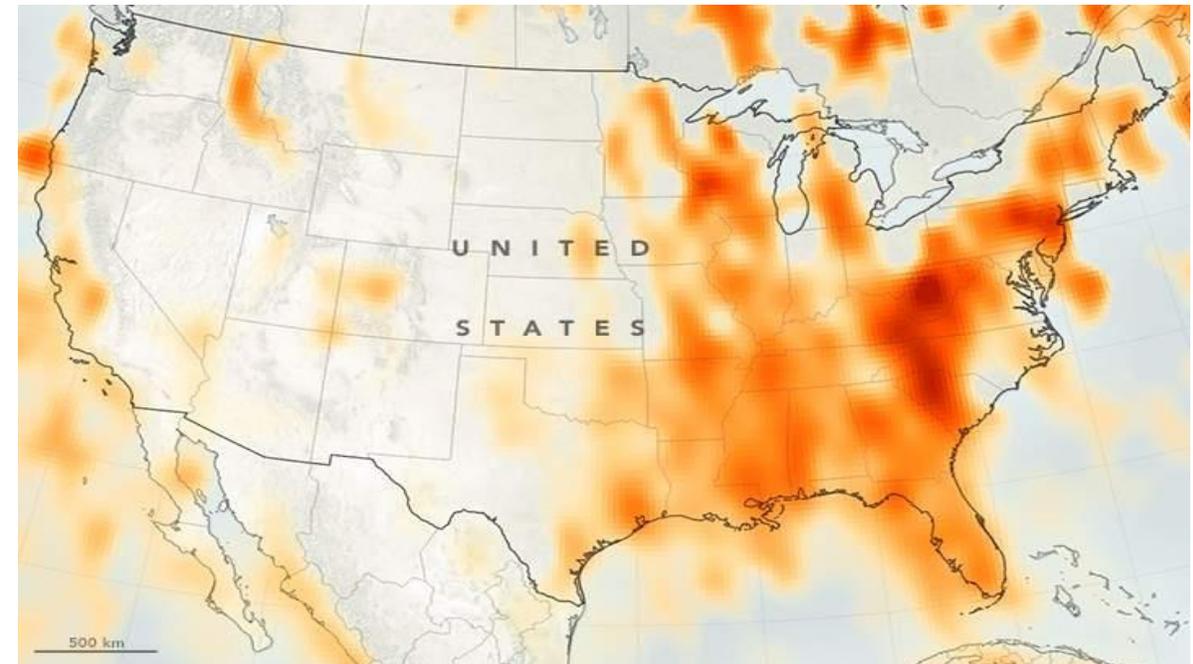


Launch: Delta II – July 2, 2014  
www.nasa.gov

Atmospheric Carbon Dioxide Concentration – January 8 to 23, 2016

## Áreas de Aplicação

-Satélite projetado para mapear emissões humanas de CO2;



XCO<sub>2</sub> anomaly (parts per million)  
0 1 2 ≥3

(2014-2016) This map depicts carbon dioxide anomalies in the atmosphere; places where CO2 levels were higher than the normal fluctuations that occur with the seasons. Source: [Earth Observatory](#)

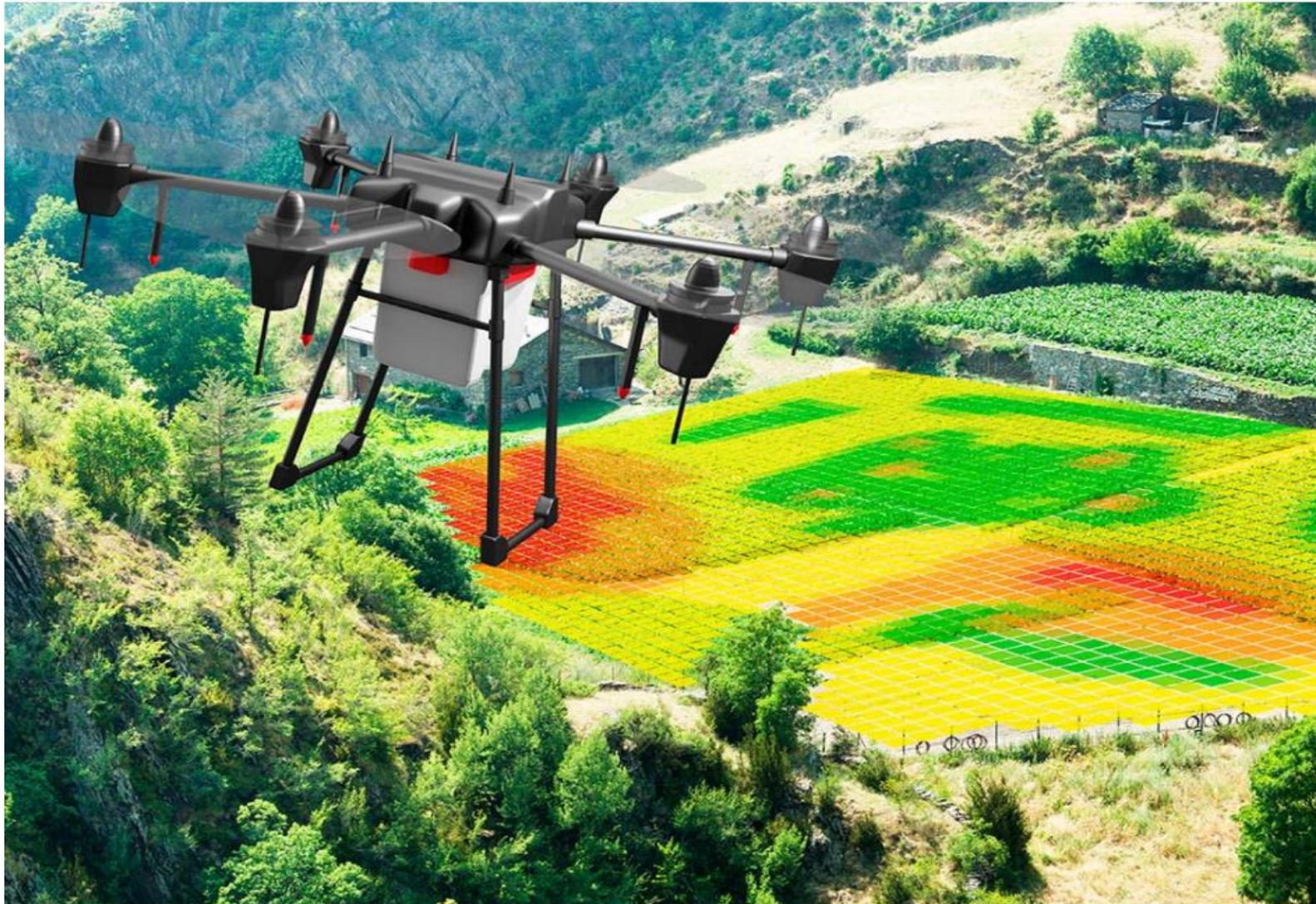


# DRONES

## Áreas de Aplicação

- Saúde da vegetação;
- Cálculo da biomassa;
- Monitoramento de desmatamento/Queimadas;
- Uso e ocupação do solo;
- Definição de APP;





<https://blog.chbagro.com.br/ndvi-o-que-e-e-como-usar-para-beneficiar-a-sua-fazenda>



## QUESTÕES

1- É possível utilizar tais geotecnologias em projetos ambientais nos municípios inseridos na Região Hidrográfica do Curu?

2- Como.....?





## Sistema de Informações Geográficas (SIG/GIS)

- ***Burrough***

“Conjunto poderoso de ferramentas para coletar, armazenar, recuperar, transformar e visualizar dados sobre o mundo real”

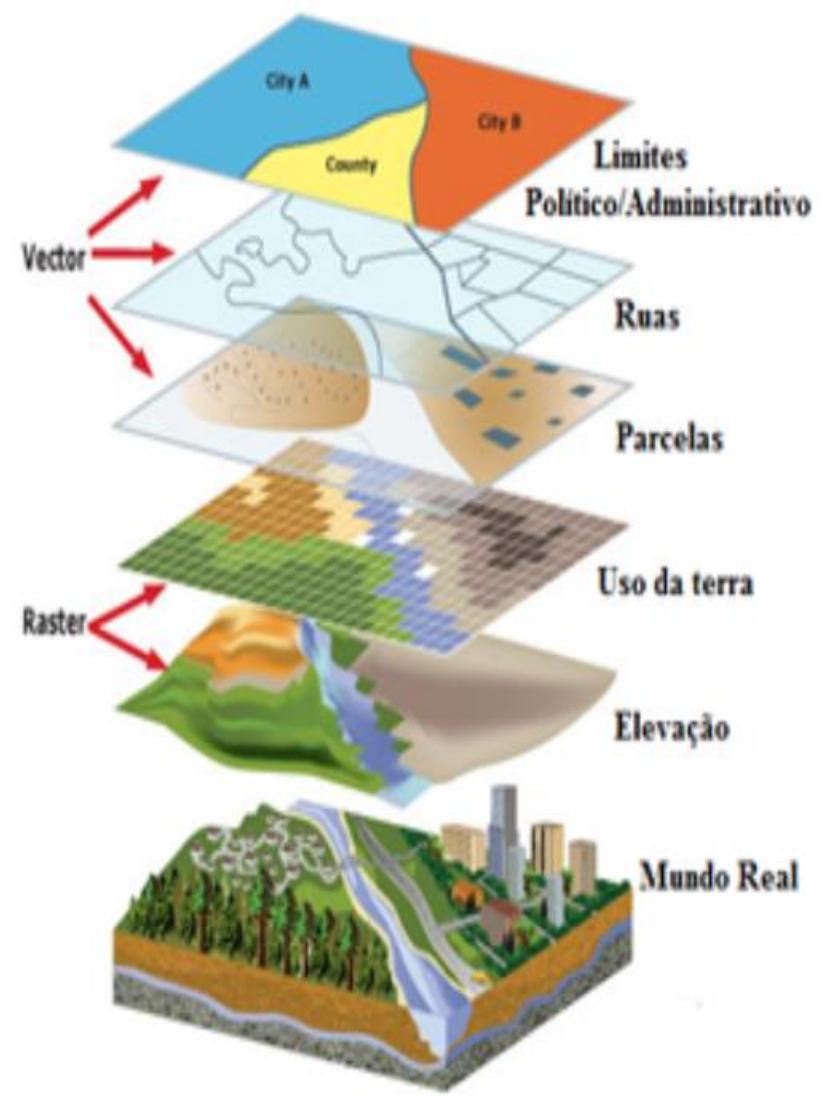
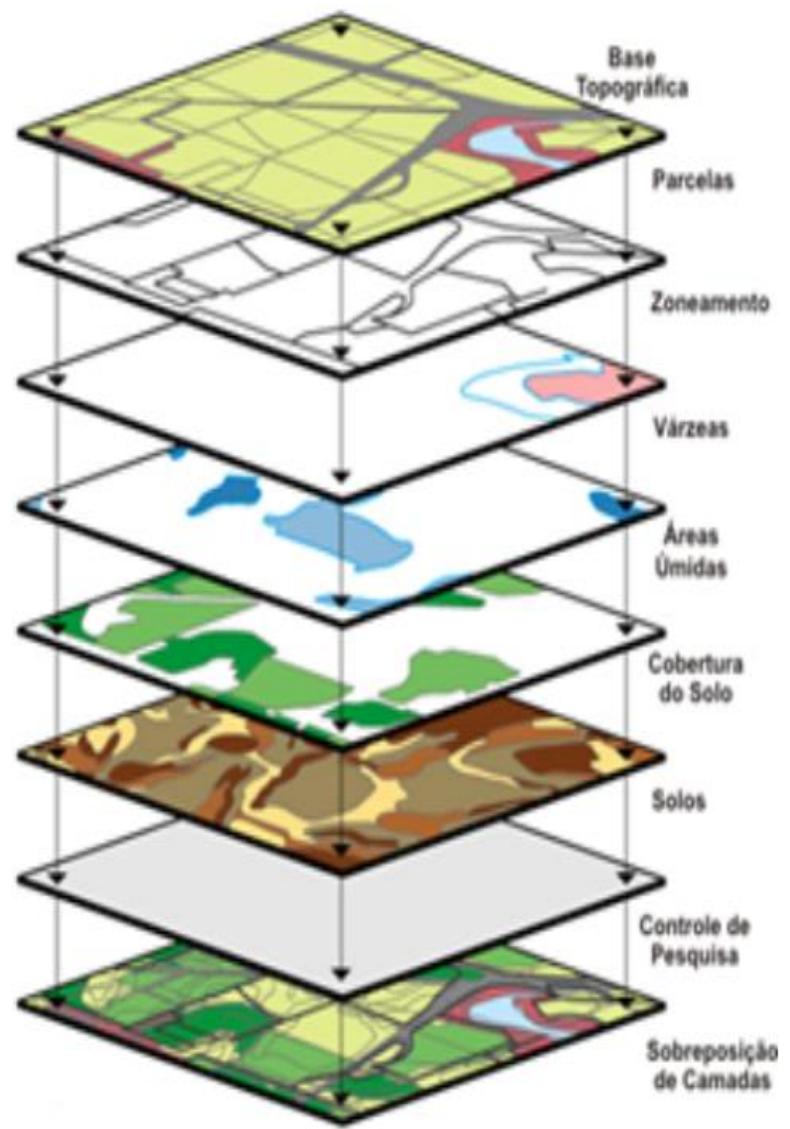
- ***Cowen***

“Um sistema de suporte à decisão que integra dados referenciados espacialmente num ambiente de respostas a problemas”

- ***Smith***

“Um banco de dados indexados espacialmente, sobre o qual opera um conjunto de procedimentos para responder a consultas sobre entidades espaciais”

### Sistema de Informações Geográficas (SIG/GIS)



## Sistema de Informações Geográficas (SIG/GIS)

The logo for QGIS, featuring the letters 'QGIS' in a bold, green, sans-serif font. The letter 'Q' is stylized with a small orange and yellow square at its top-right corner, resembling a cursor or a map icon.The logo for MapWindow, with the word 'MAPWINDOW' in a blue, sans-serif font. The letter 'O' is replaced by a small, stylized globe showing blue oceans and white clouds.

GRASS GIS

The logo for idrisi, featuring the word 'idrisi' in a bold, black, sans-serif font. The letters are set against a background of colored squares: 'i' (blue), 'd' (purple), 'r' (blue), 'i' (purple), 's' (blue), 'i' (red).

ArcGIS

# Proposta de Trabalho para o CBH-Curu



## Capacitação de Agentes Ambientais municipais



### Coleta de dados ambientais:

- Recursos hídricos;
- Saneamento;
- Desmatamento;
- Queimadas;
- Pontos de extração mineral.

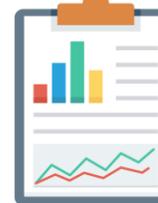


BDA

## Mapas temáticos



IFCE/COGERH



Relatórios



OBRIGADO

