Hardee Lakes Park Survey

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Report to the Hardee County Board of County Commissioners
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Background

Hardee Lakes Park, opened to the public in 2001, is located on formerly mined and reclaimed land donated to Hardee County by Mosaic.

Hardee Lakes Park

Background

DOH performed radiation surveys of the park area in 1996 as part of the state's pre and post mining monitoring program. Dose rates were typical for reclaimed land.

In September 2018, due to citizen inquiries about radiation levels in the park, the Hardee County manager requested DOH perform an additional radiation survey of the park.

In October and November, DOH performed extensive surveys of the park.

Dose Rate Units

Write	Say	Conversion
1 μR/hr	One **micro** R per hour	
1 mR/hr	One **milli** R per hour	= 1000 μR/hr
1 R/hr	One R per hour	= 1000 mR/hr

Radiation Measurement

Terminology - Units

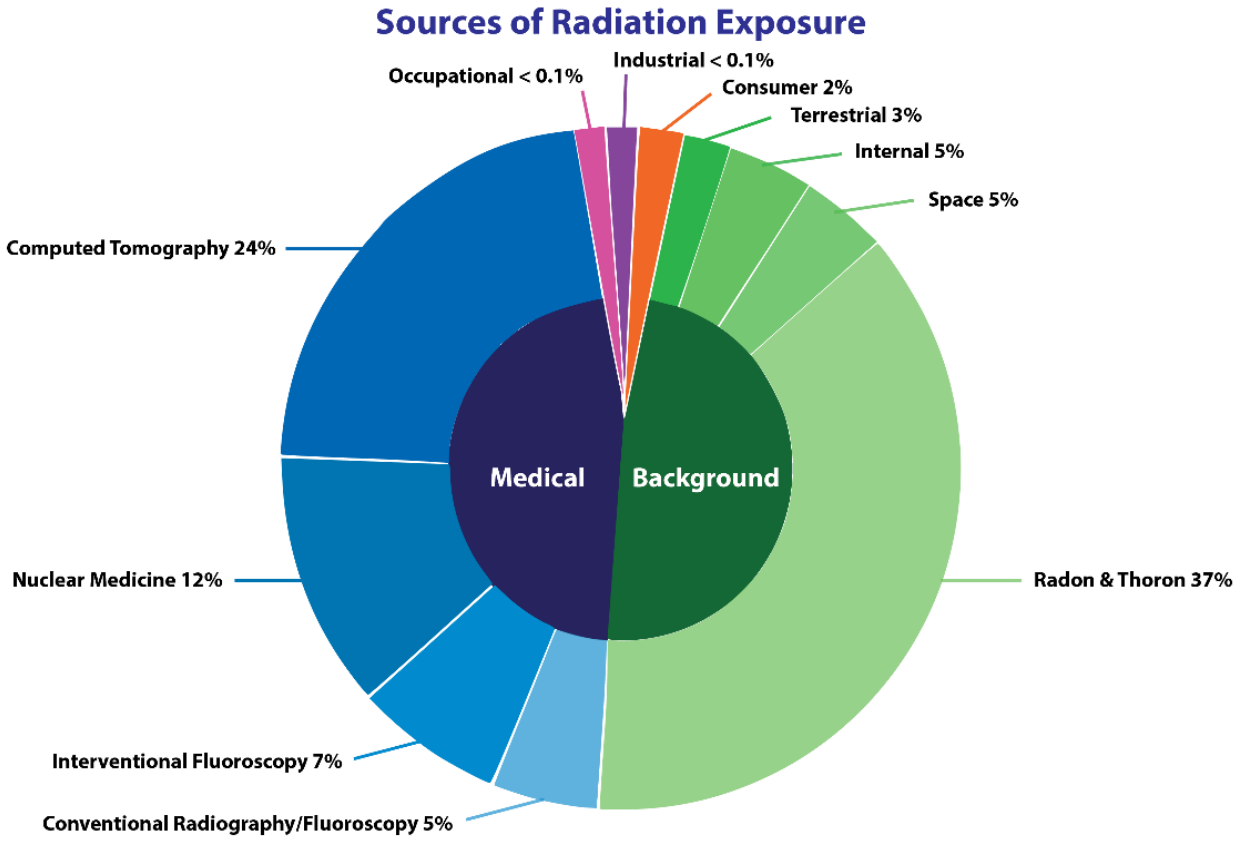
Roentgen (R) = Rad = Rem

SI unit is Sieverts, Greys

Describes amount of energy absorbed per material weight.

For environmental surveys we measure gamma dose rates.

Sources of Radiation Dose

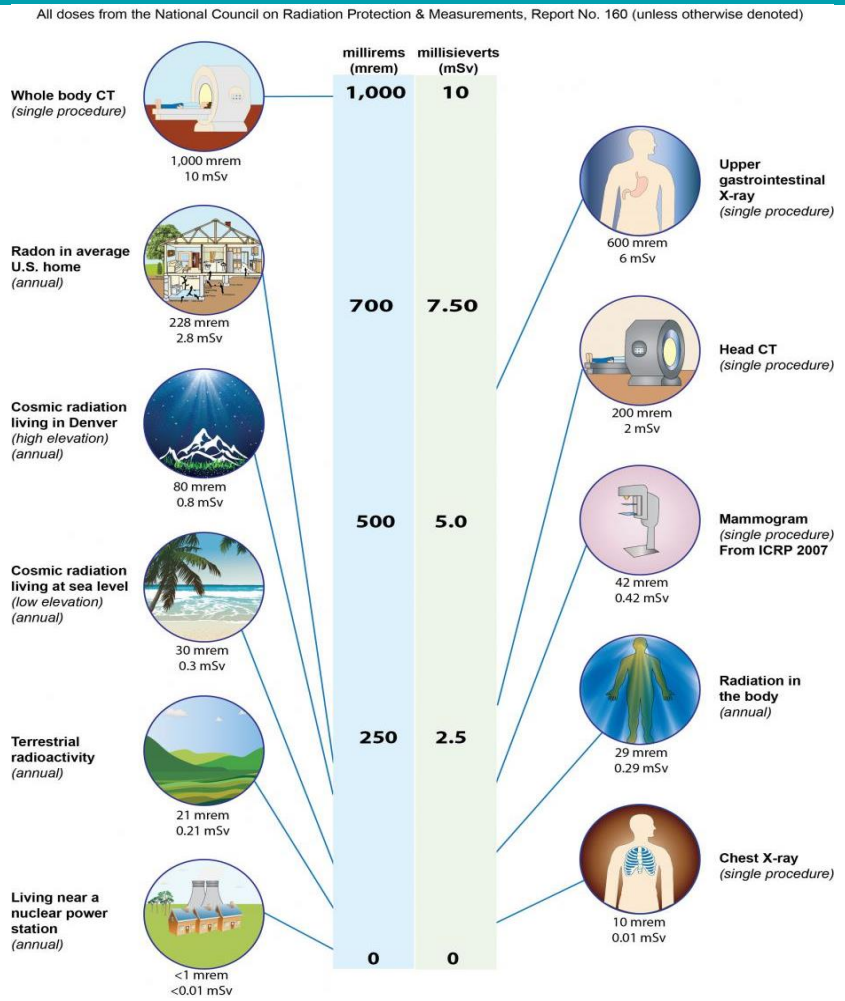


Average Annual Radiation Dose

Sources	Radon & Thoron	Computed Tomography	Nuclear Medicine	Interventional Fluoroscopy	Space
Units					
mrem (United States)	228 mrem	147 mrem	77 mrem	43 mrem	33 mrem
mSv (International)	2.28 mSv	1.47 mSv	0.77 mSv	0.43 mSv	0.33 mSv

Conventional Radiography/ Fluoroscopy	Internal	Terrestrial	Consumer	Occupational	Industrial
33 mrem	29 mrem	21 mrem	13 mrem	0.5 mrem	0.3 mrem
0.33mSv	0.29 mSv	0.21 mSv	0.13 mSv	0.005 mSv	0.003 mSv

Relative Radiation Doses



Guidance for Dose Limits

Recommended Actions	Calculated Annual Effective Dose (ATSDR and NCRP 116 Guidelines)*
Need site-specific information – remediation or removal recommended	>500 mrem/yr (above background)
Need site-specific information – mitigate risk through education or other actions where needed to reduce risk based on site-specific conditions	100 – 500 mrem/yr (above background)
No significant increase in adverse health effects expected - no action required	<100 mrem/yr (above background)

ATSDR-Agency for Toxic Substances and Disease Research
NCRP-National Committee on Radiation Protection and Measurement
*Guidance based upon gamma dose

Guidance for Dose Limits

It is important to note that the exposure depends on the dose rate and the occupancy time.

The occupancy time for park visitors (hundreds of hours?) is minimal compared to full time resident (6,300 hours per year).

Survey Equipment

Mobile surveys were conducted using Radiation Solutions Incorporated (RSI) RS-705 Mobile System with two 4-Liter sodium iodide gamma scintillation detectors mounted on Intimidator XUV.

RSI system takes one measurement each second, records measurement and location via GPS.

Handheld surveys conducted with Thermo Scientific RadEye PRD-handheld calibrated sodium iodide microR meter.

Surveys

- Surveys were conducted October 24 and November 15.
- DOH Radiation Control health physicists (HP's) collected ~7500 mobile survey data measurements.
- Surveys included mobile scans of most of the accessible roads, parking lots, boat ramp areas, and campsites.
- Where possible, vehicle drove over the campsites to determine dose rate values.

Surveys

- DOH HP's collected ~60 handheld data measurements.
- Handheld surveys were conducted of buildings, playground areas, pavilions, the park manager's residence, the camp store and docks.
- DOH HP's also conducted mobile and handheld surveys of two specific areas of citizen interest, the gravel pile, and the boat ramp near the community center.

Results

- The average mobile measurement was 13 µR/hour, the median value was 11.
- The highest mobile survey measurement was 34 µR/hour, near the Gator Lake boat ramp, on the gravel road.
- The lowest mobile survey measurement was 4 µR/hour, on the north road around Deer Lake.
- The highest handheld measurement was 36 µR/hour, on top of the gravel pile.
- The lowest handheld measurement was 1 µR/hr, near group site #3.

Areas of Special Interest

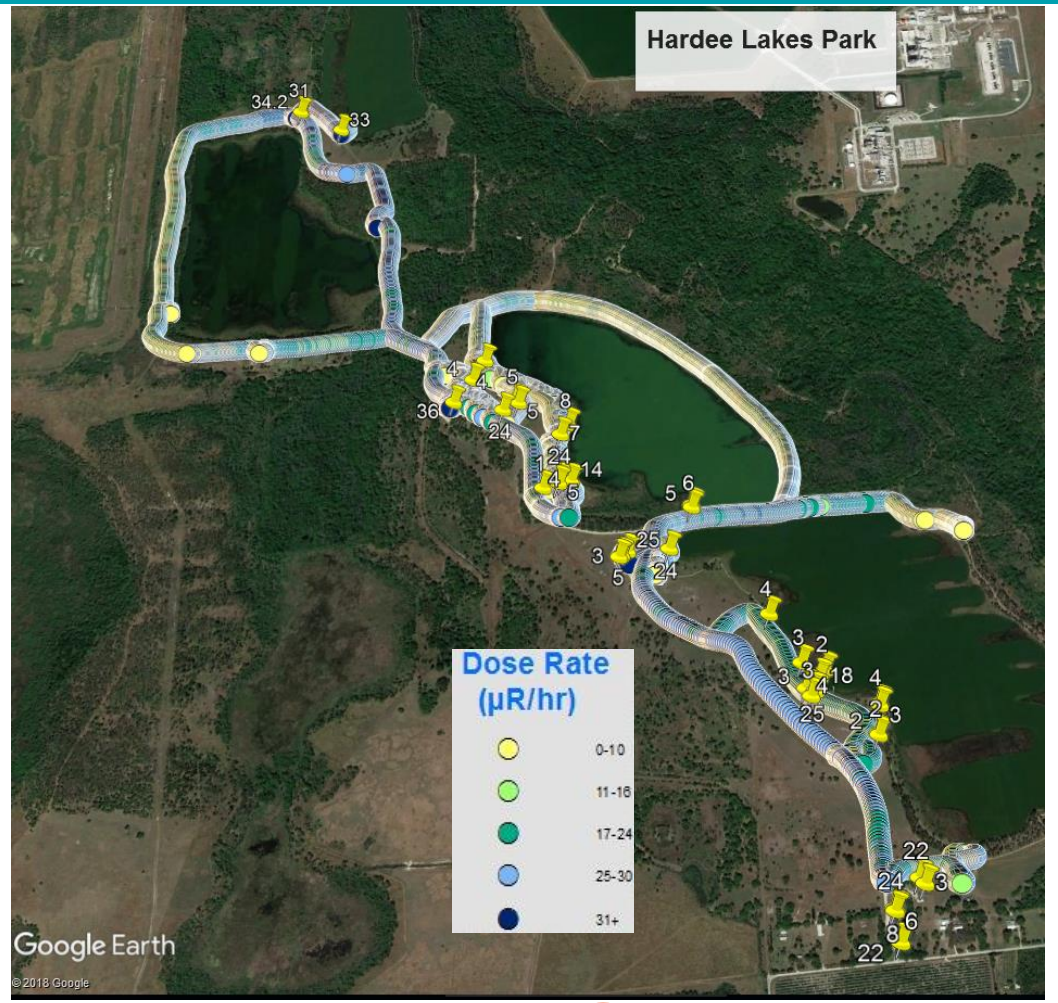
Area	Dose Rate in μR/hour*
Boat ramp near community center	24
Gravel pile	36
Playground	3
Indoor bathrooms and shower houses	5
Pavilions throughout the park	4
Park Managers residence	3

Highest Measured value by Radeye PRD

Overall Observations

- Higher dose rate values correspond to the gravel areas.
- Lower dose rate values correspond to crushed shell, dirt or grass.
- The majority of the mobile survey was conducted on the roads, thus the average mobile survey value is likely higher than the true average for the park.

Survey Map


Hardee Lakes Park
Dose Rate (µR/hr)
0-10
11-16
17-24
25-30
31+
Google Earth
© 2018 Google

Analysis

- Typical background readings in Florida are 6-10 µR/hour.
- The state of Florida uses NCRP 116 as guidance to limiting chronic (over time) radiation dose from naturally occurring radioactive material.
- To determine the dose an individual is exposed to, you must determine the occupancy times in the area.
- The park manager is considered the most exposed member of the population, based upon his residency and work at the park. Since the dose rate measured in his house (3 µR/hr) is below the typical Florida background, there is no contribution of dose to the guidance.

Analysis

- The park manager's work exposure is ~2000 hours, at an average exposure of 13 µR/hr (average mobile dose rate), his projected dose is 14 mRem per year above background, significantly below the state of Florida guidance.
- Visitors to the park are not full-time residents.
- For a visitor to the park, spending 200 hours per year at an average exposure of 13 µR/hr would produce a dose of 1.4 mRem per year above background, extremely low compared to state of Florida guidance, comparable to a dental x-ray, and within the variation of background in the United States.

Conclusion

- Analysis of the survey data show radiation levels do not exceed remediation guidance.
- Based upon this, visitors can continue to safely enjoy the park.

Questions?

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