COMBINING SAMPLE ANALYSIS AND NUMERICAL MODELING TO RECONSTRUCT THE ORIGIN AND EVOLUTION OF FLYNN CREEK CRATER, TENNESSEE: YEAR 1 STATUS REPORT. J. Hagerty[1], T. Gaither[1], D. King[2], O. Abramov[1], V. Bray[3], G. Osinski[4], H. Leonard[1], L. Petruny[2], J. Ormö[5], S. Jaret[6], J. McHone[1] and D. Adrian[2] U.S. Geological Survey, Astrogeology Science Center, 2255 N. Gemini Drive, Flagstaff, AZ 86001, email: jhagerty@usgs.gov; [2]Dept. Geological Sciences, Auburn University, Auburn, AL; [3]Lunar and Planetary Laboratory, Univ. Arizona, Tucson, AZ; Dept. Earth Sciences, [4]Univ. Western Ontario, London, ON; [5] Centro de Astrobiologia, Madrid, Spain; [6]Dept. Geosciences, Stony Brook University, Stony Brook, NY.

Introduction: Flynn Creek crater is a 3.8-km-diameter, 360-million-yearold structure located in north-central Tennessee (N 36°17', W 85°40') (**Figure 1**). The impactor likely struck a shallow sea, punching a flat hole into underlying Ordovician marine limestones [1-3]. The crater was filled with black Devonian muds that underwent lithification to become the Chattanooga Shale [1-3].

Between 1967 and 1979, Dr. David Roddy of the US Geological Survey conducted a drilling program at Flynn Creek crater [1-3]. The project produced more than 3.8 km of nearly continuous core from 18 separate bore holes. These samples are now archived, and are contained in 2,261 standard core storage boxes, at the USGS in Flagstaff, Arizona where the cores are currently being inventoried and characterized so that they can be available for scientific study.

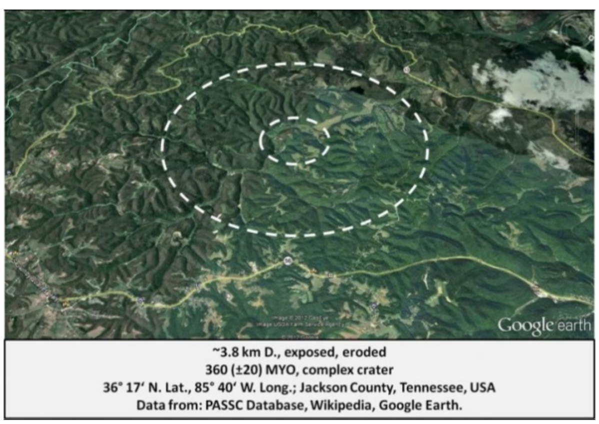

Figure 1. Google Earth view of Flynn Creek crater with an outline overlay of the crater diameter (3.8 km diameter). Source: "Flynn Creek crater," 36°16'58.4036"N 85°39'57.0622"W, PASSC Database, Google Earth, July 31, 2015.

Initial Inventory and Database Creation: One of our first project goals was to establish a sample database and project webpage for the USGS Flynn Creek Crater Sample Collection. The database contains the following information for all 18 cores in the collection: core number, original core box number, archive location code, drill core latitude and longitude (if known), depth intervals, and drill core location in crater (central uplift, crater floor, crater rim). For drill cores 1, 2, and 3, the following additional information is documented: condition of core, original drilling notes (for three holes), general lithologic description, and geologic unit designation. In addition, photographic documentation procedures were developed and implemented to provide a more complete descriptive entry for each core box in the collection (**Figure 2**); we have photographed ~500 boxes of core so far.

Figure 2. Example photograph of one of the 2,261 boxes of drill core from the Flynn Creek crater. Sample notes, scale bar, and color bar provided for identification and characterization purposes.

A beta version of the project website is live at the URL http://astrogeology.usgs.gov/facilities/flynn-creek-crater-sample-collection (**Figure 3**). The online maps and satellite imagery are complete. Three base-layers and two overlay geologic maps have been added to the Web Map Service WMS. The maps have been configured and tested with the Flynn Creek extents and a new version of our map-display code (Openlayers). The core's metadata are fully ingested into Astropedia, allowing the product display page, the interactive map, and the request form to launch. The metadata template and parser have been completed. Search categories, including lithology keywords, depth level, core and box number have been added to the database. Ingestion code has been amended to handle multiple core files with individual XML metadata attachments.

As part of our inventory and characterization efforts, we have used optical character recognition scanning software to digitize the original drill core log descriptions, as well as, geologic maps and cross sections from the historical collections of Dr. David Roddy. These materials are critical for characterizing the drill cores and for making the materials accessible to interested members of the scientific community.

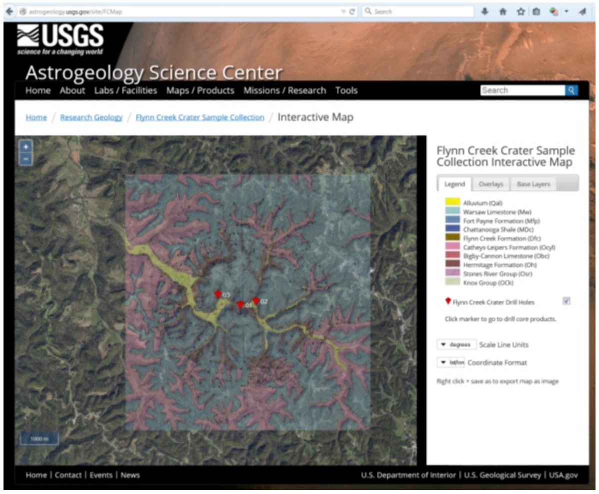

Figure 3. Screen capture of the new project webpage for the USGS Flynn Creek Crater Sample Collection.

Future Work: For the remainder of project year 1, we will continue the documentation and characterization of drill cores from the USGS Flynn Creek Crater sample collection. Moving into year 2, Co-Is King and Osinski and their teams will begin the optical and compositional analysis of materials from the crater. Co-Is Abramov and Bray will continue to iterate numerical modeling variables in an effort to further understand the impact event. PI Hagerty and Co-I Gaither will begin the microbeam analysis of samples from the central peak of the crater in an effort to understand the effects of impact-induced hydrothermal activity [e.g., 4] and to document any geochemical signatures introduced by the bolide.

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