

Submission in Response to NSF CI 2030 Request for Information

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Research Domain, discipline, and sub-discipline

Habitat

Title of Submission

Global Geospatial Habitat Assessment over Time

Abstract (maximum ~200 words).

Habitat is essentially a function of Biological, Chemical and Physical Systems over Space and Time (BCP/ST) for every species. Extracting a global BCP/ST is a petascale compute challenge.

Question 1 Research Challenge(s) (maximum ~1200 words): Describe current or emerging science or engineering research challenge(s), providing context in terms of recent research activities and standing questions in the field.

The NSF funded UMN Polar Geospatial Center (PGC) has started to solve this problem with their phenomenal work to scale up continental, sub-meter, cyclical mapping of our polar regions through the use of Blue Waters. The ability to map the changing terrain for the Arctic in a year with commercial satellite imagery is revolutionary as PGC proved with the surface Digital Elevation Model of the Arctic in the past year. We can now begin to think about our changing environmental systems in four dimensions for entire continents and the planet. So 'when' will we expand the (PGC) approach to create an expanded system to answer the fundamental questions of habitat for particular species of interest? What is the population of Bald Eagles in Illinois for example on January 1, 2017?

Question 2 Cyberinfrastructure Needed to Address the Research Challenge(s) (maximum ~1200 words): Describe any limitations or absence of existing cyberinfrastructure, and/or specific technical advancements in cyberinfrastructure (e.g. advanced computing, data infrastructure, software infrastructure, applications, networking, cybersecurity), that must be addressed to accomplish the identified research challenge(s).

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Question 1 would be answered by creating a 3D vegetation canopy map for the State of Illinois tied to sub-meter optical satellite imagery coverage in the last year with current Jan. 1, 2017 satellite imagery to map the unfrozen, waters where Bald Eagles tend to congregate. This requires bringing the research questions to the data in a system like Blue Waters to process the massive amounts of satellite imagery. This cannot be feasibly be done by any other commercial, federal or state agency in the coming years due to the massive influx of multiple, sub-meter, imagery takes each day that begins this spring with Planet imagery (planet.com). To create the global BCP/ST, this will also require the geospatial infrastructure to pull other petascale, geospatial layers from a variety of local to global sources in an automated fashion. Given the compute nature of Blue Waters, this will require creation of open source, image object software tools to extract the habitat features in an automated process.

Question 3 Other considerations (maximum ~1200 words, optional): Any other relevant aspects, such as organization, process, learning and workforce development, access, and sustainability, that need to be addressed; or any other issues that NSF should consider.

Technically, the objective is feasible and obtainable by NSF. The biggest challenge will be to merge the different NSF program 'silos' to implement the approach on a global scale. Can an Institute of Global Geospatial Habitat be created at our Universities in partnership with federal, state, tribal and local programs to address our Habitat Infrastructure?e through Petascale Compute Infrastructure?

Consent Statement

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