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Western Governors' Association (WGA)
Western Governors' Wildlife Council (WGWC)
Western Wildlife Crucial Habitat Assessment Tool (CHAT)

Regional Viewer Application (RVA)
System Architecture Vision – 20 August 2012

Prepared by the WGWC CHAT Technical Leads Regional Viewer Workgroup

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INTRODUCTION

The purpose of this document is to provide a high-level preliminary overview as of August 2012 of the business, data, application and technology architecture components envisioned for the Western Wildlife Crucial Habitat Assessment Tool Regional Viewer Application (henceforth RVA). Supporting documents include the *WGA Wildlife Corridors Initiative Report* (2008) and the *Western Governors' Wildlife Council White Paper -Version II: Western Wildlife Crucial Habitat Assessment Tool (CHAT): Vision, Definitions and Guidance for State Systems and Regional Viewer (Revised August 2011)* - both found at http://www.westgov.org/initiatives/wildlife. Related documents to be produced in the future will include the *RVA design and development request-for-proposal*, and the *RVA application outreach and management plan*.

Process: This document has been developed by the WGWC CHAT Technical Leads Regional Viewer Workgroup, consisting of representation from six WGWC member states, five of whom have completed development of an initial version of their respective state CHAT applications. Established in December 2011, the workgroup's charge is to oversee design and development of the RVA, including establishment of design specifications and evaluation of development strategy alternatives. The *RVA System Architecture Vision* is the first product in scoping and defining the RVA's design specifications and it has been reviewed by the WGWC and all the state CHAT technical leads.

In addition to workgroup members' expertise and experience, information informing this document included: (a) a questionnaire survey of state CHAT technical leads; (b) an evaluation by the workgroup of approximately 15 existing environmental decision support applications; and (c) suggestions and ideas provided by a wide range of application developers and end-

users, including participants in the WGA-American Wind Wildlife Institute *Workshop on GIS-based Tools for Renewable Energy Development* held in Denver in January 2012.

The goal in producing the vision document is to gain additional feedback from eventual users of the RVA as well as the developer and end-user communities. Based on this feedback, a revised version of this document will be used to inform the development and release of an RVA design and development request-for-proposal in fall 2012. The WGWC will select a partner thereafter to assist with development of the RVA such that it is available to the public by the end of 2013. Equally eligible bidders will include state and federal government entities, academia, non-government organizations and the private sector. Presently, the total estimated project budget for development of the RVA is $85,000 to $150,000.

Organization of this Document: The *RVA System Architecture Vision* is loosely based on the structure of the *TOGAF® Enterprise Architecture Development Method*[1], an industry standard in information technology application development. In this case, enterprise architecture refers to the organization of an information technology system serving a significant user base for a specified purpose. It includes a description and specified structure of the system's components, their relationships to one another, and the assumptions, resources and constraints governing the system's design, implementation, and use. The remainder of this document considers RVA development issues associated with four interrelated enterprise architecture components. (See Figure 1).

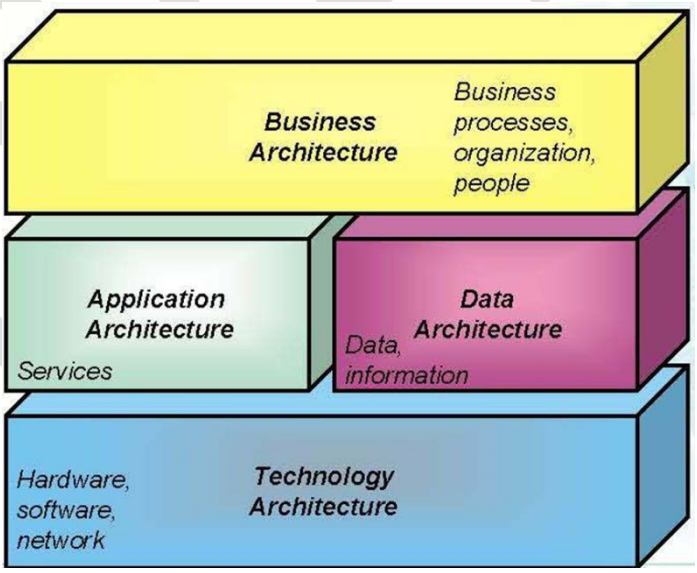

Figure 1. TOGAF®-based Enterprise Architecture Components

[1] Josey, A. 2011. *TOGAF Version 9.1 Enterprise Edition: An Introduction.* San Francisco, CA, The Open Group.

Business architecture considerations are concerned with the user base's people, business practices and workflows, and their relationships to each other and the operational environment. Data architecture is concerned with the content, representation and management of information incorporated within the system. Application architecture addresses such issues as functionality and user interface design, while the technology architecture is primarily concerned with hardware, software and communications / networking specifics. Each component will be addressed in greater detail in subsequent iterations of the design process.

BUSINESS ARCHITECTURE

Vision and Need:[2] The vision of the WGWC is to identify key wildlife corridors and crucial wildlife habitats in the West and to develop and coordinate policy options and tools for conserving those landscapes. The WGWC seeks to develop public, user friendly, online tools at both the state and regional level with consistent, west-wide information on crucial habitats for fish and wildlife for all interested parties to use to assess landscapes and connectivity while better informing land use decisions. Termed *Crucial Habitat Assessment Tools* or CHATs, these software applications are being designed to improve the analysis of landscape-scale energy, land use, and transportation projects as well as land conservation and climate adaptation strategies by providing consistent fish and wildlife information to potential developers, conservationists, and resource managers engaged in the early stages of development and conservation planning processes.

State-level CHATs are not intended for site-specific planning, but will utilize landscape-level mapping to show crucial wildlife habitat and wildlife corridors to inform broad-scale project assessments and help identify areas that warrant finer scale analysis. CHATs will be non-regulatory, with a focus on promoting the conservation objectives of each state wildlife agency and providing the public access to important wildlife information for use in proactive planning and decision-making processes.

In conjunction with development of the state CHAT applications, the WGWC is also pursuing the development of a regional mapping viewer (the "regional CHAT" or "Regional Viewer Application" (RVA)). While housed in each state, data utilized in the state systems will be coordinated across all jurisdictions in the West so that a regional picture of crucial wildlife habitat and important wildlife corridors will be available through the RVA. The RVA will combine individual state crucial habitat layers together as derived, single regional layers. This

[2] This section includes a summary of information provided in the *Western Governors' Wildlife Council White Paper -Version II: Western Wildlife Crucial Habitat Assessment Tool (CHAT): Vision, Definitions and Guidance for State Systems and Regional Viewer (Revised August 2011)* - found at http://www.westgov.org/initiatives/wildlife.

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regional view will be useful to inform large-scale planning spanning multiple jurisdictions, and it will be particularly useful for depicting important corridors for fish and wildlife across the region. Importantly, the RVA will not replace any individual state or sub-regional viewers deemed necessary for providing important fish and wildlife information at a finer scale. However, the RVA could conveniently link to individual state CHATs or sub-regional CHATs, and individual state systems could also consume and display the regional crucial habitat layer(s).

System Purpose: As currently envisioned, the RVA will have two primary and equal purposes. First, the RVA will serve as an early-planning stage, landscape assessment tool for industry interests considering development opportunities in the West. Second, it will support proactive, landscape-context conservation considerations associated with multi-state, cross-boundary issues in the region. In these roles, the RVA will support discovery, access, and use of region-wide data related to crucial fish and wildlife habitat, and will serve as a general planning tool for both development and conservation concerns through query, display, and analysis of regional fish and wildlife resource characteristics and interstate development issues. The RVA will also serve as a gateway for accessing more detailed state-specific data and analysis resources through the state-specific CHAT applications.

System End Users: As a complement to the state CHATs, the RVA will serve a similar and partially overlapping clientele. Primary end users will be state agencies (including state wildlife agencies); federal agencies, development interests (e.g., transportation, power transmission, and pipeline infrastructure planners); and non-government conservation organizations (NGOs) concerned with interstate or other potential cross-boundary development activities and conservation planning opportunities.

Secondary users of the RVA could include state, local, and federal officials and their staffs, as well as educational interests ranging from K-12 teachers to academic researchers. Other, yet-to-be-identified end-user groups may emerge as version one of the RVA is released and awareness of its content and functionality increases.

DATA ARCHITECTURE

Data Content: It is anticipated that the RVA will contain a significant collection of operational thematic geodata layers, other reference geodata layers, and metadata documentation, along with ancillary non-spatial data and information such as textual documentation, imagery, and other multi-media resources.

The RVA will contain the overall crucial habitat layer(s) once developed. The primary operational (i.e., dynamic, query-able) layers contained within the application may include the region-wide Tier 1 crucial habitat data aggregated according to a standardized, regionally consistent hexagonal grid. These layers, developed by the states, will describe information on relative rankings of crucial habitat based upon the five Tier 1 data categories outlined in the *Western Governors' Wildlife Council White Paper -Version II: Western Wildlife Crucial Habitat Assessment Tool (CHAT): Vision, Definitions and Guidance for State Systems and Regional*

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Viewer (Revised August 2011). The layer categories include: species of concern, native and un-fragmented habitat, riparian and wetland habitat, habitat connectivity, and sport fish and game animal habitat quality. It has not yet been determined if the information from these five categories will be aggregated into one summary layer for crucial habitat as a whole or remain separate.

As currently conceived, the RVA will not host any input data that were used to derive the aggregated crucial habitat layers (i.e., state-specific information or species occurrence data). More state-specific information would be provided in a state CHAT. These details are still under consideration by the collective CHAT leads in western states, and ultimately the Wildlife Council. However, the RVA may contain other region-wide operational data layers, such as land management status, protected areas, watershed boundaries, hydrography, transportation, or other standard data layers that may be useful in the land-use decision making process. Finally, the RVA will contain standard reference base map data, hosted either locally or through mapping services, that includes scale-dependent satellite and aerial imagery, terrain, topography, and other general reference information.

Metadata: Metadata communicating accuracy, uncertainty, and appropriateness of use will be tightly linked to all geospatial and ancillary datasets and made accessible via both selection and query functions.

APPLICATION AND TECHNOLOGY ARCHITECTURE

Two principles guiding the preliminary scoping of the RVA's application architecture are: (1) providing as much functionality as possible while maintaining ease-of-use for the typical end user; and (2) avoiding infringement on the focus of state-specific CHATs.

Overall, the RVA is anticipated to use web service-based geospatial technologies[3] to host applications and data services within a managed environment. A customized, WGA-branded user interface will be a major component of the completed tool. By design, the interface will be intuitive, easy to use, easy to learn, and accessible by the non-technical user.

It is also envisioned that the RVA will serve as a complement to the state CHATs focused not only on West-wide information synthesis, but also on supporting a certain degree of interoperability and integration with state CHAT functionality and data.

[3] Web Services Architecture, W3C Working Group Note 11, February 2004. Source: http://www.w3.org/TR/ws-arch/ (accessed 10 August 2012).

The following is a list of state CHATs completed and publically available as of the date of this document's publication:

- AZ: *Arizona HabiMap* –
  http://www.habimap.org/
- CA: *California Areas of Conservation Emphasis* –
  http://www.dfg.ca.gov/biogeodata/ace/
- CO, KS, NM, OK, TX: *Southern Great Plains CHAT* –
  http://kars.ku.edu/maps/sgpchat/
- MT: *Montana Crucial Areas Planning System* –
  http://fwp.mt.gov/fishAndWildlife/conservationInAction/crucialAreas.html
- WA: *Washington Priority Habitat and Species on the Web* –
  http://wdfw.wa.gov/conservation/phs/
- WY: *Wyoming Interagency Spatial Database & Online Management System* –
  http://wisdom.wygisc.org

Figure 2 below is a simplified graphical representation of the relationships between the RVA, the State CHATs and the RVA stakeholders. State CHATs contribute data to the aggregated, region-wide crucial habitat database layers, which are made accessible via the RVA to stakeholders possessing technical capabilities ranging from Web clients to desktop GIS to other applications seeking to ingest or 'point' to the RVA and its content. Though not explicitly shown, it is envisioned that end-users may access State CHATs either through a redirect from the RVA application or directly through the individual state CHAT interfaces.

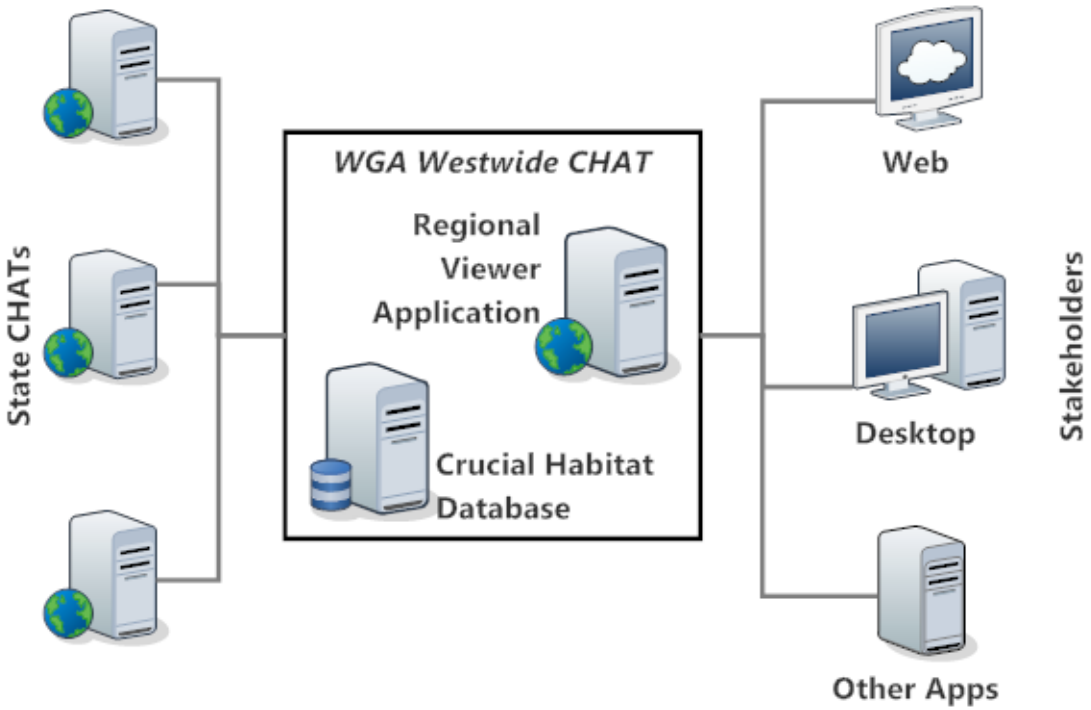

Figure 2. RVA Application Connectivity

System Functionality: The following is a list of initial functionality considered to be 'foundational' in version one of the RVA:

- Navigation
  - Display, pan, zoom, locator gazetteer
- Visualization
  - Map display, generation and image export
- Query
  - Identify tool(s), spatial and tabular queries
- Reporting
  - Formatted onscreen summary text & graphical reports, document export
- Comment / feedback

It is also anticipated that data layers unique to the RVA will be made available as mapping services for use in other compatible applications and that users will be provided with the ability to download certain 'unique' region-wide data layers, either for the entire region or for a smaller, user-defined area of interest via a customizable 'clip, zip, and ship' process.

Additional functionality identified for consideration in future versions of the RVA application includes, but is not limited to: spatial proximity analysis (e.g., buffering, overlay); multi-criteria suitability assessment (e.g., corridor design evaluation); 3D 'fly-thru' visualization; and asynchronous distributed collaboration environments. Scalability to support possible mobile client accessibility will also be considered.

Information Technology Considerations: Consideration of the logical software and hardware capabilities required to support deployment of the RVA is beyond the scope of the current version of this vision document. It is anticipated that RFP for eventual development of the RVA application will include a requirement for delivery of a detailed design document addressing specifics of proposed supporting IT infrastructure, middleware, networks, communications, processing, storage and security requirements, as well as an assessment of the long-term resources necessary for the WGA and Wildlife Council member states to sustain CHAT-related business practices and workflows into the future.

COMMENTS

Comments on this document may be submitted through September 4, 2012 to Jeff Hamerlinck (Wyoming Geographic Information Science Center), RVA Work Group Lead, at jeff.hamerlinck@uwyo.edu . A summary response of comments received will be appended to a revised version of this document prior to release of the RVA RFP (anticipated September/October 2012).

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