Earth Systems Institute's
All Lands, All Stakeholders, Science Tool Initiative
(2010-2012)

Earth Systems Institute (ESI) has launched an initiative to put advanced analysis and visualization tools into the hands of all stakeholders across all lands in the western United States in support of natural resource management. The desk top analysis and visualization tools are multi functional, designed to provide decision support for aquatic habitat management, forest management and other land use activities, pre- and post-wildfire planning, restoration, conservation and climate change vulnerability assessments.

NetMap is a community based watershed science system comprised of uniform digital watershed (map) databases, analysis tools, and technical support materials. The state of the art, desktop analysis tools contain approximately 70 functions and 80 parameters and they address fluvial geomorphology, aquatic habitat development, erosion, watershed disturbance, road networks, wildfire, hydrology, and large wood in streams, among other processes and attributes. NetMap is designed to integrate with ESRI ArcMap 9.2/9.3 and with non-proprietary GIS systems.

Community Analysis, Visualization and Decision Support System

NetMap coverage area

Proposed

Proposed

Completed & pending

Standardized, contiguous digital map data

Erosion Temp Habitat LWD

Community Tool Library (plug & play)

All lands,
All stakeholders:
-consistency,
-economic efficiency
-collaboration
-communication

Host platform(s) select & customize tool applications

Decision Support:
-forestry
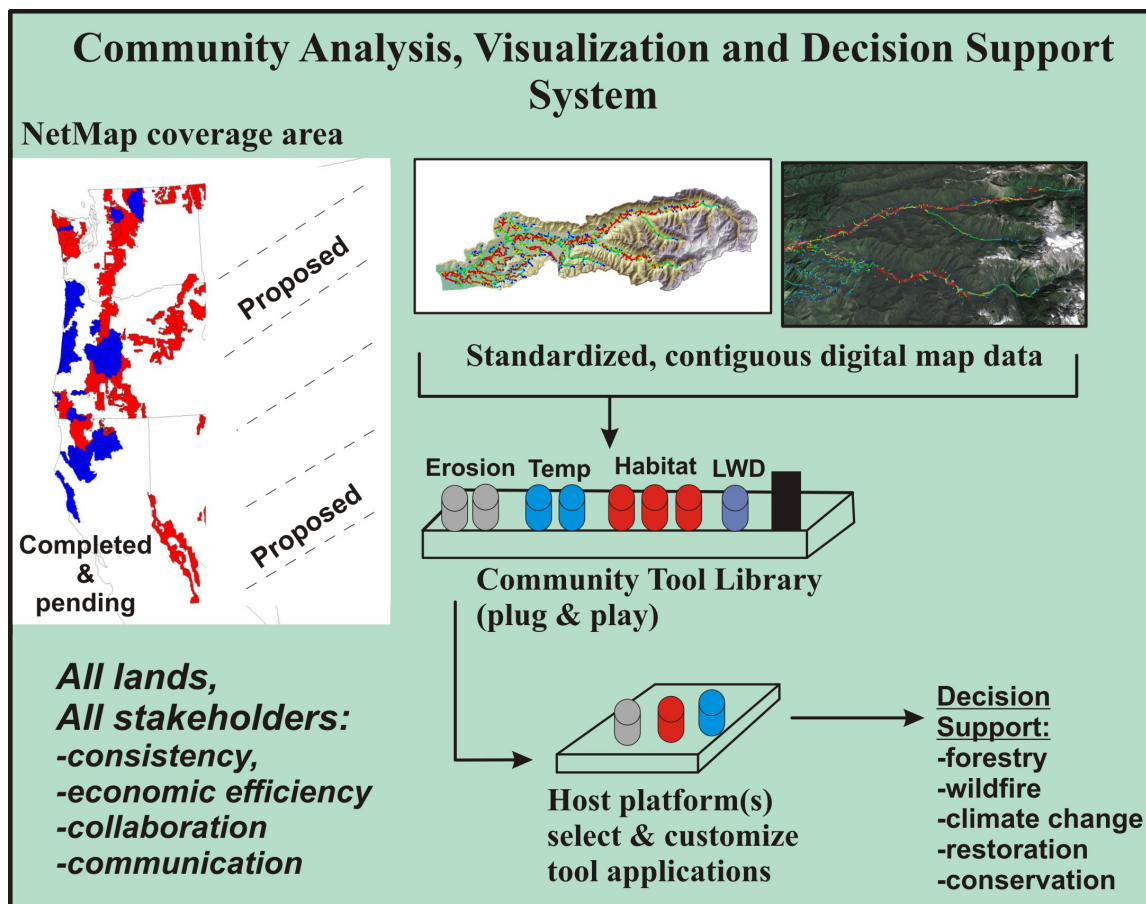-wildfire
-climate change
-restoration
-conservation

Figure 1. NetMap is based on standardized, contiguous digital map databases that interact with a plug & play analysis tool library (erosion, stream temperature, in-stream wood etc.) to create customizable analysis platforms for decision support in a wide range of natural resource activities (refer to the 2009 American Geophysical Union article on "The Future of Applied Watershed Science at Regional Scales" for additional information [available for download at the bottom of NetMap's home page]).

The uniform and attributed stream map databases can be downloaded, and then adjusted with respect to locations of channel heads, drainage density and the length scales of stream networks (default stream segment length scale averages 100 m but is variable depending on along-stream variation in attributes such as channel gradient, width and valley width). The map database is attributed with information including segment ID, elevation, gradient, width, length, valley/floodplain width, and annual precipitation, among other information.

Users across the coverage area can rectify the map databases (adjust channel heads and drainage density, as well as adding drainage peculiarities such as diversions, artificial channels and dams) and upload the corrections back to the server (through a gate keeper). Thus, NetMap's standardized stream layer provides more accuracy, functionality, and flexibility compared to the NHD (although it uses some of NHD's attributes). In NetMap, information attributed in other GIS stream layers, including the NHD, can be transferred to the NetMap stream layer and vice versa, using tools within the NetMap system.

A uniform digital map database facilitates the 'community' nature of NetMap in that its partners, and other users, can build and upload analysis models and decision support systems to the 'tool library' for their use in building customizable tool (host) platforms. Community based also refers to the development of standardized stream (map) databases that are made available to everyone across the coverage area.

NetMap
Community Based Analysis and Decision Support System

(1) Contiguous, attributed[1] stream map database

(2) Tool host platform(s)
(use w/ or independent of ArcGIS)

generic apps:
-query
-routing
-overlap

User input data
-roads
-vegetation
-fire risk
-burn severity
-polygons
etc.

rectify

Download & adjust[2], create custom stream layer

Ecosystem "Hotspot" maps (in Google Earth)
-rivers and streams
-floodplains
-habitats
-erosion potential

User selects/customizes

(3) Tool library
(analysis plug ins)

Decision Support Systems

Erosion   Temp   Habitat   LWD

Community Tool Library

Populated by ESI, partners & users

Maintenance & Support

[1] incl. elev, gradient, length, valley width, annual precip.

[2] adjust headward extent (density) & segment lengths (or use default)
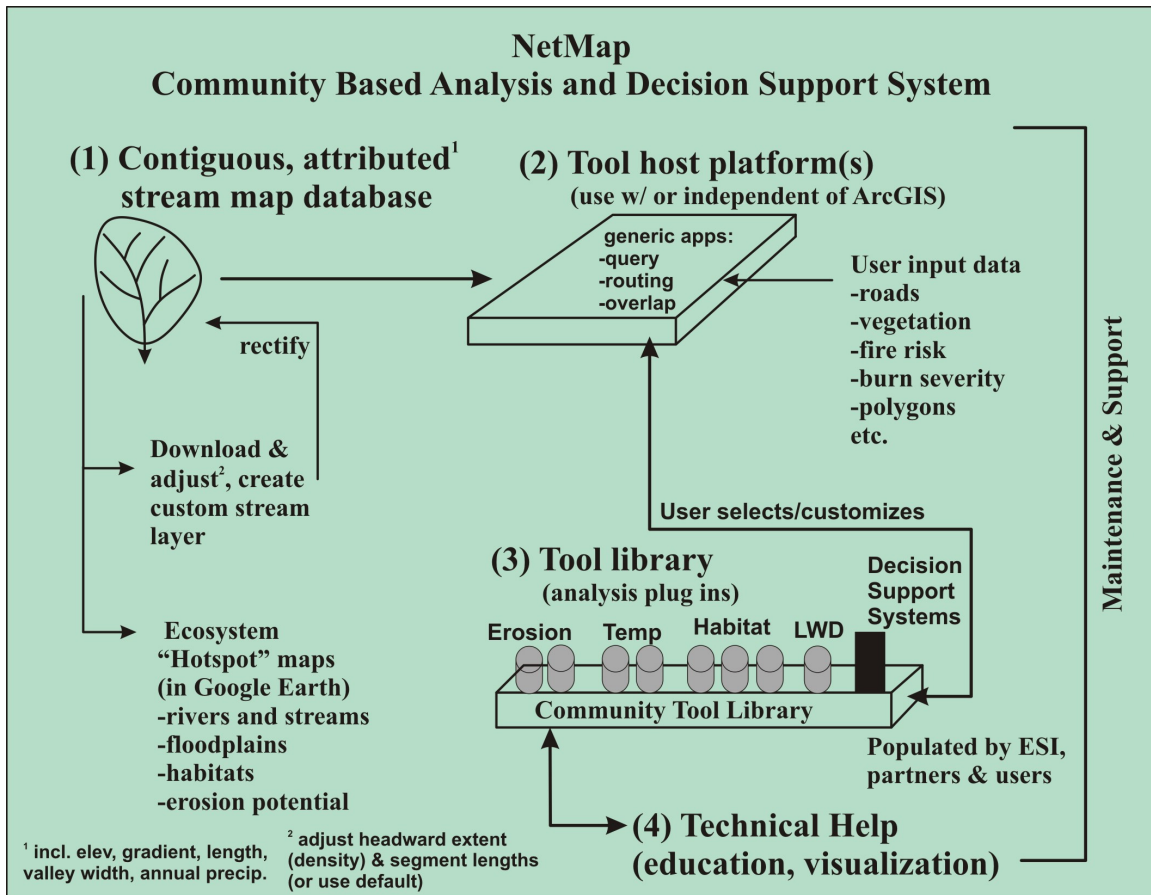
(4) Technical Help (education, visualization)

Figure 2. The NetMap system consists of a (1) uniform, contiguous and attributed stream map database that can be adjusted and corrected by users, and then uploaded back to the web-based watershed database (through a gate keeper). This allows a more accurate stream terrain database to be developed over time. Google "hotspot" maps are part of the uniform database system and they are designed as educational and visualization resources for those with little to no GIS experience or tools (Figure 3). The tool host platform (2) is based on ArcGIS (ArcMap9.2/9.3, and eventually 10) and it contains a suite of GIS-based and non-GIS analysis tools for creating, querying and routing information through a watershed. Users can customize analysis platforms (3) by selecting tools from the 'community tool library'. The tool library is populated by ESI and by other partners, as well as by users (through a gate keeper). A large selection of technical help and educational materials is available within NetMap (4). Maintenance and support agreements also will become available.

The "All Lands, All Stakeholders Science Tool Initiative" is currently being developed. Uniform watershed databases (100 million acres by the end of 2010) and a fully loaded analysis platform (all tools in an ArcMap 9.2/9.3 platform) are available for immediate download from NetMap's website (www.netmaptools.org).

NetMap's Google "hotspot" maps will include fish habitats, floodplains, erosion potential and so forth (parameters draped onto Google Earth images [Figure 3]) to provide an educational and visualization resource for those not having GIS capabilities. These will be available by mid 2010 across the western U.S.
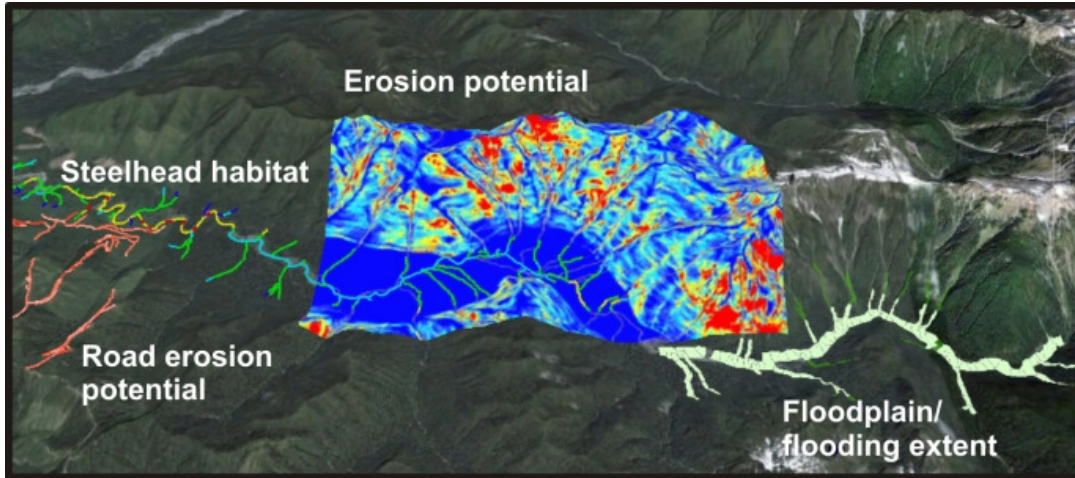

Figure 3. NetMap's 'hotspot' maps: predictions for steelhead habitat, road erosion potential, hillslope erosion potential and extent of floodplains and flooding potential in the Hoh River basin in northwest Washington are draped onto a Google Earth image (NetMap contains a tool for exporting any NetMap parameter into Google Earth). Warmer colors (red and yellows) indicate better intrinsic habitat conditions, higher road erosion potential, and hillslope erosion potential (mass wasting and gullying. Hotspot maps will be available for all of the western United States by mid 2010.