Linking remote sensing and process-based hydrological models to increase understanding of wildfire effects on watersheds and improve post-fire remediation efforts

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Project Summary: Rapidly integrate NASA Earth Observations into process based models in order to aid post-fire mitigation.

Earth Observations applied: Burn severity maps can be derived from multispectral imagery (Landsat, EO-1 ALI, SPOT, ASTER, VIIRS )
**Purpose and Objective**

Provide tools and datasets that will allow for the integration of NASA Earth Observation data of burn severity into process based models in order to aid decision-making activities related to post-fire risk assessment and rehabilitation. This work is needed as assembling the data needed to run spatially explicit erosion models can be a daunting task even without time constraints, therefore preparing the required input data ahead of time makes sense.

**Societal Benefit Area(s):** Protect life, property, & natural resources

**Geographic Focus:** CONUS with emphasis on fire prone states

**Targeted End-Users:** BAER Teams, hydrologists, watershed managers and researchers

**Approach**

Create an online spatial database to support post-fire remediation through erosion modeling. Our database (http://geodjango.mtri.org/geowepp/) for the Western US is online and allows users to import burn severity maps which are combined with soils and land cover to rapidly provide spatial model inputs. By preparing ahead of time the modeling work can be carried out rapidly and the results can be used for decision-making activities related to post-fire risk assessment and rehabilitation. The rapid response website delivers model inputs in mere seconds; previously assembling and formatting this type of data would have taken multiple days.

*Database already used operationally for multiple fires: Canyon Creek, OR; Clearwater, ID; Butte, CA; Valley, CA; Soberanes, CA; Happy Camp, CA; Silverado, CA; King, CA*

*"Your WEPP research was a key input for the “Watershed Clearinghouse,” a joint FEMA-State technical services group" Mary M. Shaw FEMA Emergency Management Planner*

**Key Milestones**

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
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<tbody>
<tr>
<td>Allow users to upload new burn severity maps into database</td>
<td>11/14</td>
</tr>
<tr>
<td>Expansion of database to Western US</td>
<td>05/15</td>
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<tr>
<td>Database used by BAER Teams on the Valley &amp; Butte fires, CA; Canyon Creek fire, OR and for fires in Clearwater NF fires, ID</td>
<td>10/15</td>
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<tr>
<td>Expansion of database to CONUS</td>
<td>06/16</td>
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<tr>
<td>NEW open source spatial WEPP interface!!</td>
<td>12/16</td>
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<tr>
<td>Online empirical Debris Flow model &amp; Ravel Rat</td>
<td>06/17</td>
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<tr>
<td>Complete transfer of database to Forest Service online toolset</td>
<td>08/17</td>
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*ARL* 

*Start = 4  Most Recent = 7  Goal = 9*
Biggest Achievement or Advancement to Date
Biggest Achievement or Advancement to Date

for **Fuels Planning**
- Mokelumne
- Flagstaff
- **Clear Creek Study**

for **BAER Teams**
- Canyon Creek, OR
- Clearwater, ID
- Butte, CA
- Valley, CA
- French, CA
- Happy Camp, CA
- Silverado, CA
- King, CA
- Sherpa, CA
- Soberanes, CA
- Fish, CA
- **Cedar, CA**

for **Validation study**
- High Park, CO
Challenge:
Rapid Response Erosion Database (RRED) is Ready now we need modelers!

Solution:
Prepare the modelers!
1. Training – Workshop 3/16 follow up with webinar
2. NEW easy to use WEPP interface - QWEPP
3. Manuals & exercises
Summary of Challenges; Problems; Objective Analysis

RRED is ready; our end users need preparation as well!
To overcome this issue:
- New open source interface
- Modeling workshop
- Plan to follow up with a webinar
- Easy to use manual available online

Transfer of RRED may be challenging

Ravel RAT runs slowly

So to Rev up Ravel RAT
- Increased min mass
- Split out KML generator
- Divide & Conquer

Signs of Positive Progress

New easy to use open source interface delivered to Forest Service.

Independent Users! Cedar Fire, Clear Creek fuels study, TMDL

The database has provided support on over a dozen active wild fires and at least four fuels projects.

Forest Service partners are looking into servers

Elements of our program are at ARL: 9 as the products have been used to spatially prioritize ~ 4 million in mulching treatments.
Update & Transfer
Rapid Response Erosion Database
Release QWEPP (QGIS interface to Water Erosion Prediction Project) with Technical Report
Transfer of Ravel Rat & Paper
Socioeconomic Analysis & Paper
Transfer Plans:
- Communicate with partners
- Open source software
- Instructions for installation
- Help desk services
- Leverage socioeconomic study to promote new resources
We will need to submit a no-cost extension in order to perform the socio-economic study.

We are currently on track to finish our primary objectives and most of our secondary objectives.

We currently expect to use all the funds by Spring of 2018.
Highlight (perhaps bullet) steps remaining to achieve your project goals and when do you expect for these to be accomplished.

• Release QWEPP to the public (April 2017) with a technical report \ manual (May 2017)
• Transfer RRED to our operational partners (June 2017)
• Transfer RavelRAT & Debris Flow interfaces to our partners (June 2017) and submit paper for peer review (Aug 2017)

My Forest Service partners would appreciate a server to house the database with associated backups – MTRI can continue for a while.

Training support for the tool going forward

I think my biggest challenge is communication - I need to interact more with my partners and end users so that I better understand their needs and challenges!

Budget progress and future plans to spend down the funding by year.

\[ ARL_{Start} = 4 \quad ARL_{Most \ Recent} = 7 \quad ARL_{Goal} = 9 \]
PI Overall Assessment: Impact

Honest Opinion

The combination of our NASA BAER Rapid Response Erosion Database (RRED) and our new open source modeling interface makes it feasible for BAER Teams to use process based models operationally.

The new tools also have the capacity to significantly broaden the use of spatial WEPP models for multiple applications including mining and agricultural.

Project’s Impact/Potential as an Analogy

Make a fun analogy to describe the project’s overall potential impact

Our baseball analogy:

*Our project will be a home run, but it will take a few extra innings!*

It will take time for users to discover and utilize our database and new interface.
Relevant Publications, Awards, Accomplishments


Workshops:


Best oral presentation!
2015 International Symposium on Remote Sensing of the Environment

**Press releases:**


Relevant Publications, Awards, Accomplishments

Database being used independently by:
- Cedar fire BAER Team
- Clear Creek fuels project
- EPA TMDL
- Students

End users: USDA FS, EPA, FEMA, BLM, CALFIRE, BIA, Academia

Apps for BAER Teams
Concluding Comments

Thank you!

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http://geodjango.mtri.org/geowepp

Questions?