EGU 21 Session SSS9.6 – 'Managing wildfires in a changing world.

Debris Yield Modeling Application Under Post-Wildfire Condition with Hydrologic Modeling System (HEC-HMS)

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BACKGROUND

- Predicting debris yield under post-wildfire conditions is important for hazard mitigation and flood risk planning. Current prediction efforts aim to reduce the amount and impacts of debris flows that minimizes environmental and economic impacts for communities.
- Debris flows and excess runoff block access roads and bridges, inhibiting emergency responses. It also effects the surrounding community's water supply and property. Therefore, having a debris flow sediment management plan is crucial. Predicting debris yield volume, estimating debris basin capabilities, and developing yield mitigation alternatives will mitigate future debris yield disasters.

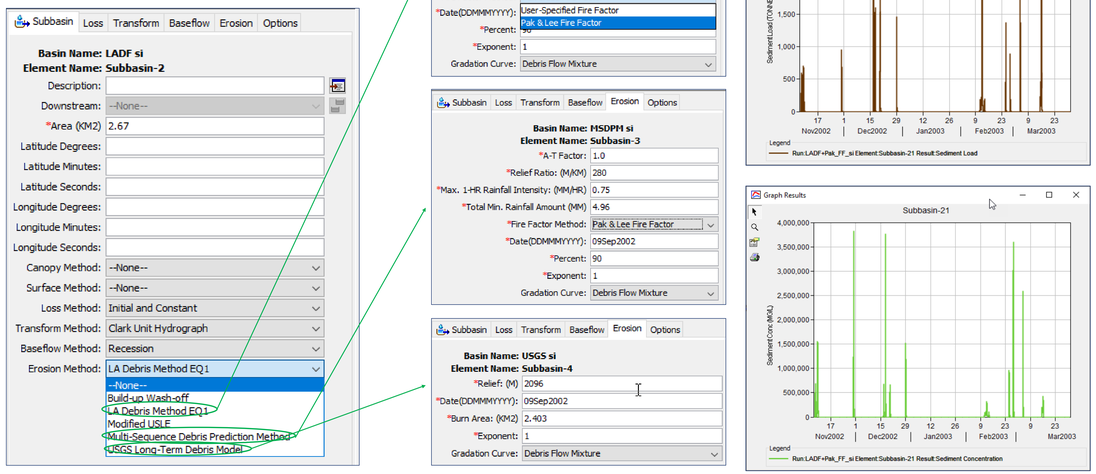
OBJECTIVE

To provide a practical tool within HEC-HMS to predict debris yield/flow based on field data (Precipitation, Topography, and Soil Burn Severity).

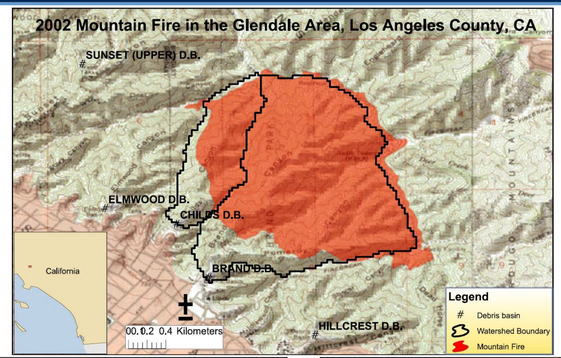
METHODS

The Hydrologic Engineering Center has added five empirical models for predicting debris yield volumes under post-wildfire conditions:

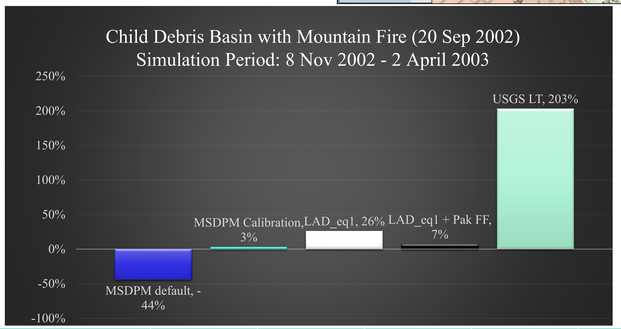
- LA Debris Method EQ 1
- LA Debris Method EQ 2-5
- Multi-Sequence Debris Prediction Method (MSDPM)
- USGS Emergency Assessment Debris Model
- USGS Long-Term Debris Model

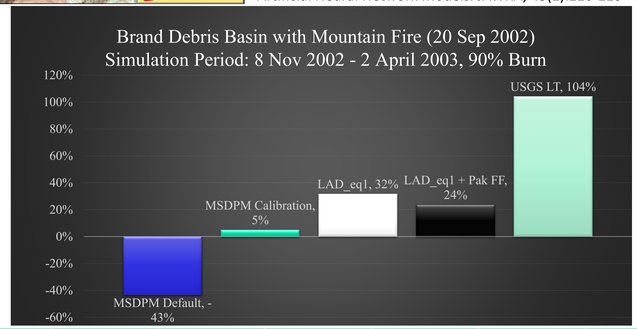


CASE STUDY RESULTS: COMPARISON OF DEBRIS METHODS



Source of Fire Map: Pak, et al., 2009, Predicting Debris Yield From Burned Watersheds: Comparison of Statistical and Artificial Neural Network Models. JAWRA, 45(1):210-223





Debris Basin	Area (ha)	Burn Area (%)	Relief Ratio (m/km)	Measured Sediment Yield (m^3)	MSDPM (m^3)	MSDPM Diff. (%)	LAD EQ. 1	LAD EQ. 1 Diff. (%)	LAD EQ.1 + Pak FF (m^3)	LAD EQ.1 + Pak FF Diff. (%)	USGS LT (m^3)	USGS LT Diff. (%)
Brand	267	90	280	81385	85422	5	107184	32	100697	24	166109	104
Childs	81	80	314	22249	22956	3	28083	26	23879	7	67434	203

DISCUSSION

- The new debris yield modeling capabilities will increase the application of HEC-HMS for debris yield modeling studies by directly computing yields from burned watersheds.
- Results from HEC-HMS can be coupled with the Hydrologic Engineering Center's River Analysis System (HEC-RAS). Output from HEC-HMS could be easily used as boundary conditions in an HEC-RAS model for predicting the hydraulic non-Newtonian debris flow runout and inundation.
- Reach and reservoir debris routing methods are being developed. Meanwhile, existing HEC-HMS sediment routing methods in reach and reservoir elements can be used with certain limitations when used to simulate debris routing.

REFERENCES

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