A Tool for Evaluating Recharge Benefits at Easement Scales

Meeting of the City of San Antonio
Conservation Advisory Board
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It is important to quantitatively assess potential conservation easement properties

- EAPP conservation easements represent a large investment of local resources
- Continued high interest and support from the public
- Need to be able to provide quantitative estimates of past effectiveness and future investment
  - Current assessment tools are important but lack some capabilities
- Some previous efforts to assess the program have lacked strong technical bases for conclusions
- Needed for effective implementation of EAA's Next Generation Concept

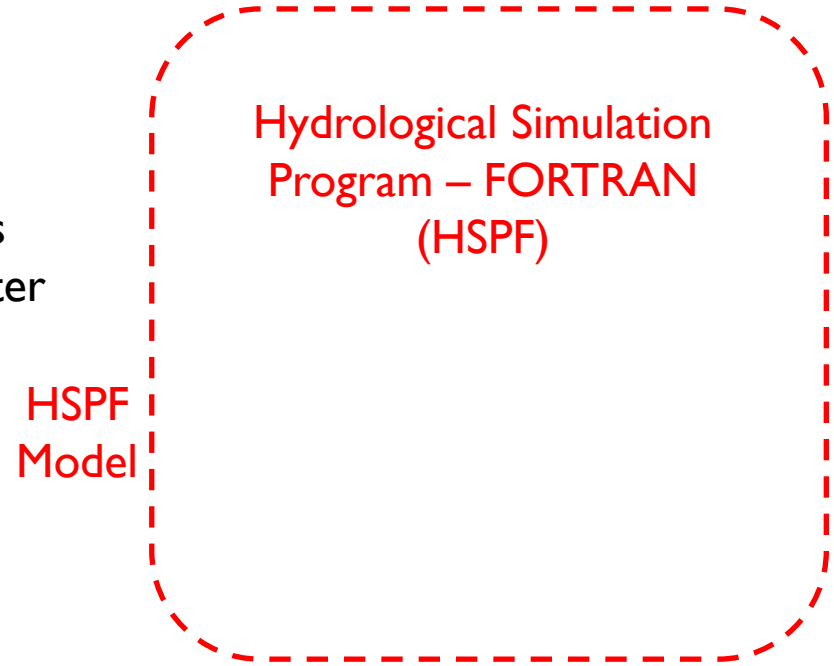
A new approach

- SwRI and EAA developed a proposed assessment methodology that can address some of the deficiencies of previous efforts to quantify the effectiveness the EAPP

  "Evaluation of the Efficacy of the Edwards Aquifer Protection Program." 2020. Nicholaides, K., G. Wittmeyer, and R. Green. Contract Report to the Edwards Aquifer Authority.

- Used a geographic information systems (GIS) tool that is informed by existing watershed models
- The tool can be extended and revised by leveraging knowledge from previous work and coupled groundwater-surface water modeling efforts in the region

A watershed model previously funded and developed by EAA to evaluate alternative recharge calculations is used to generate a water balance



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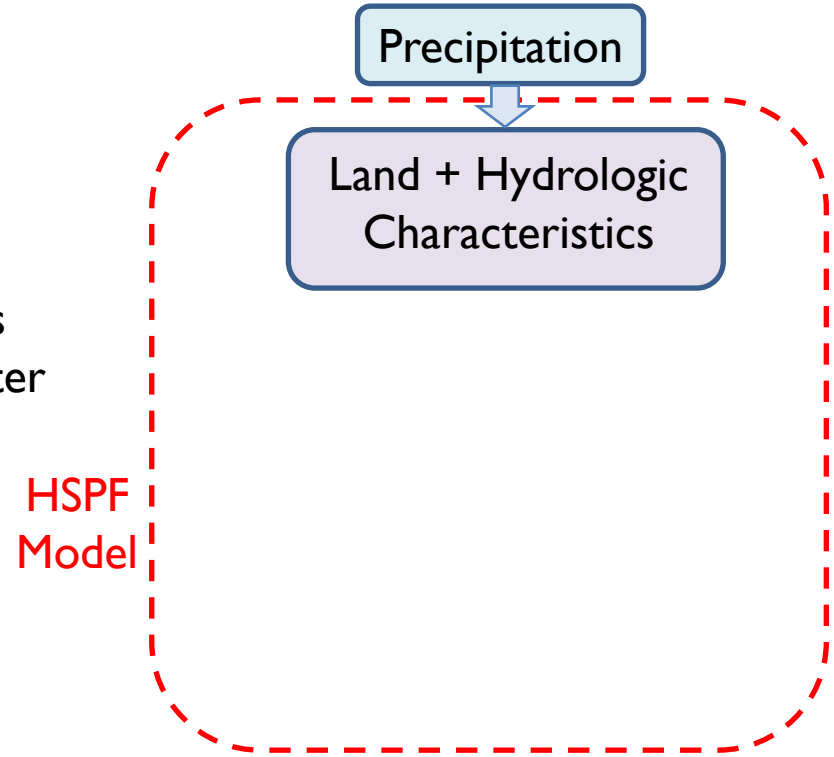

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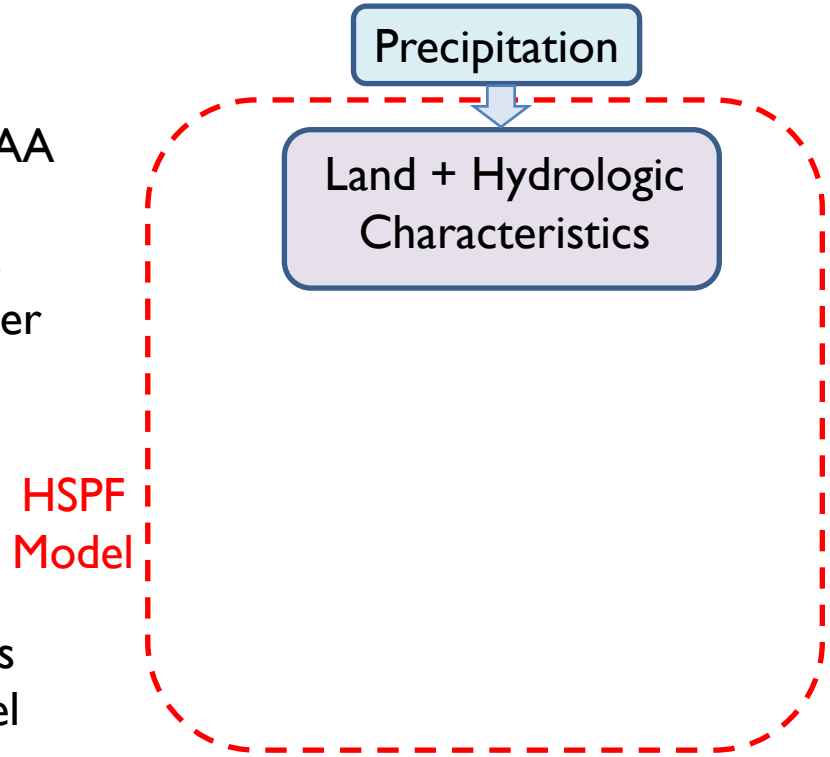

The three main outputs of the watershed model are (i) ET losses, (ii) runoff, which eventually becomes stream flow, and (iii) infiltration

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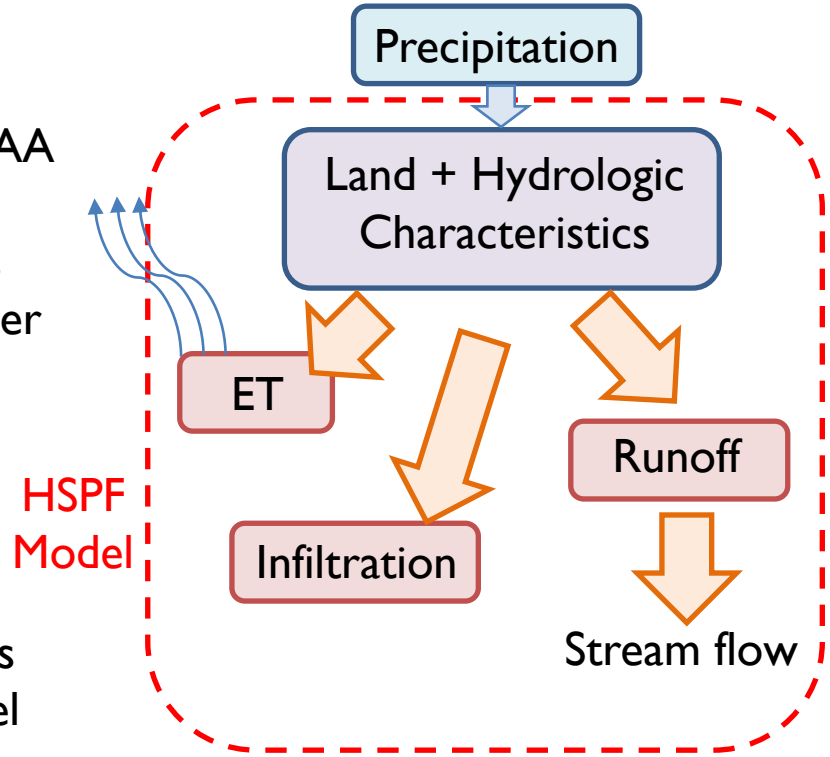

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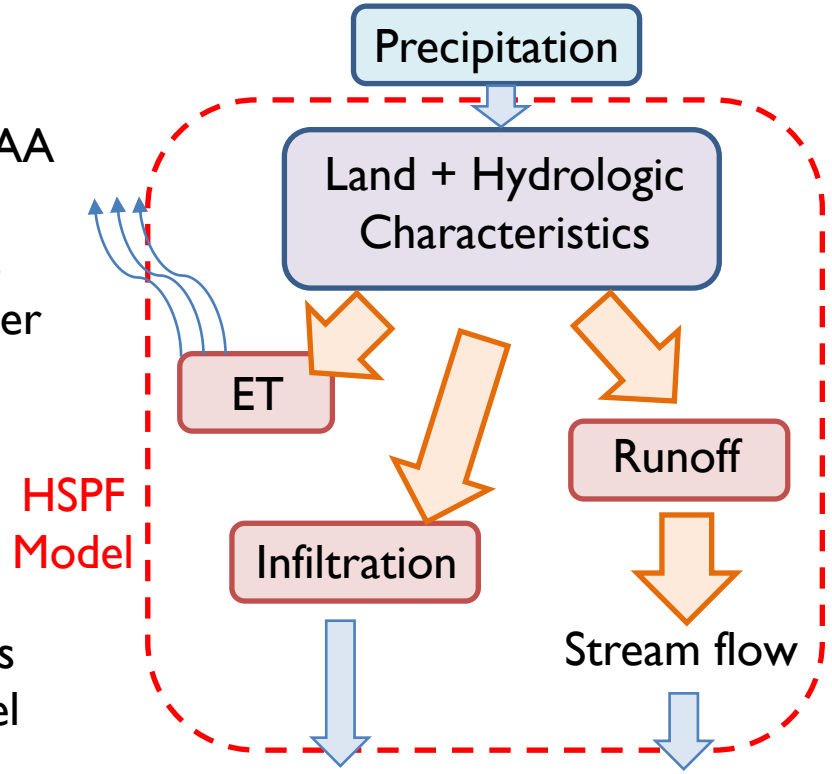

The three main outputs of the watershed model are (i) ET losses, (ii) runoff which eventually becomes stream flow, and (iii) infiltration

Output from the watershed model can be processed to extract information to calculate recharge from infiltration* and stream channels in a given watershed

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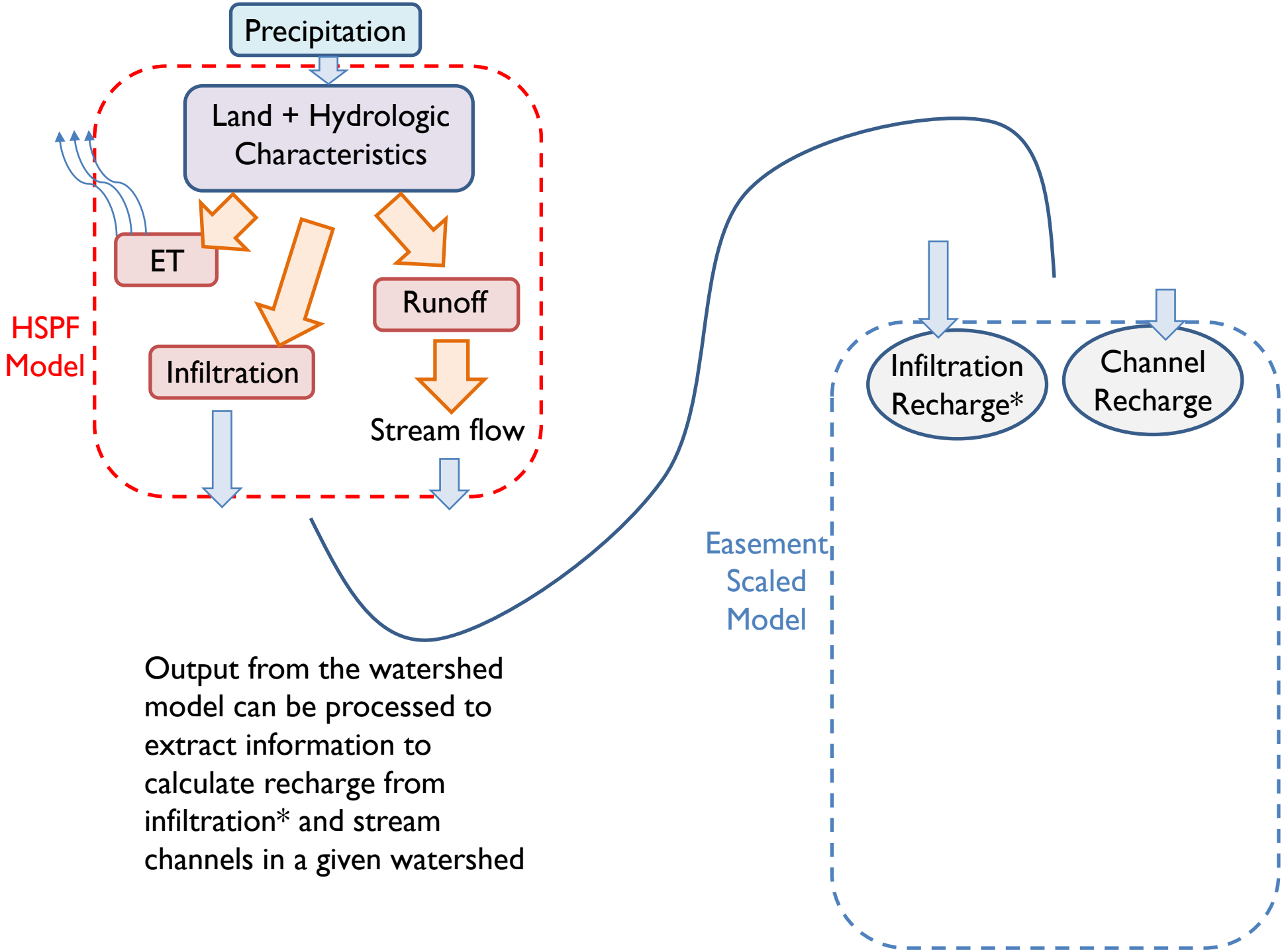

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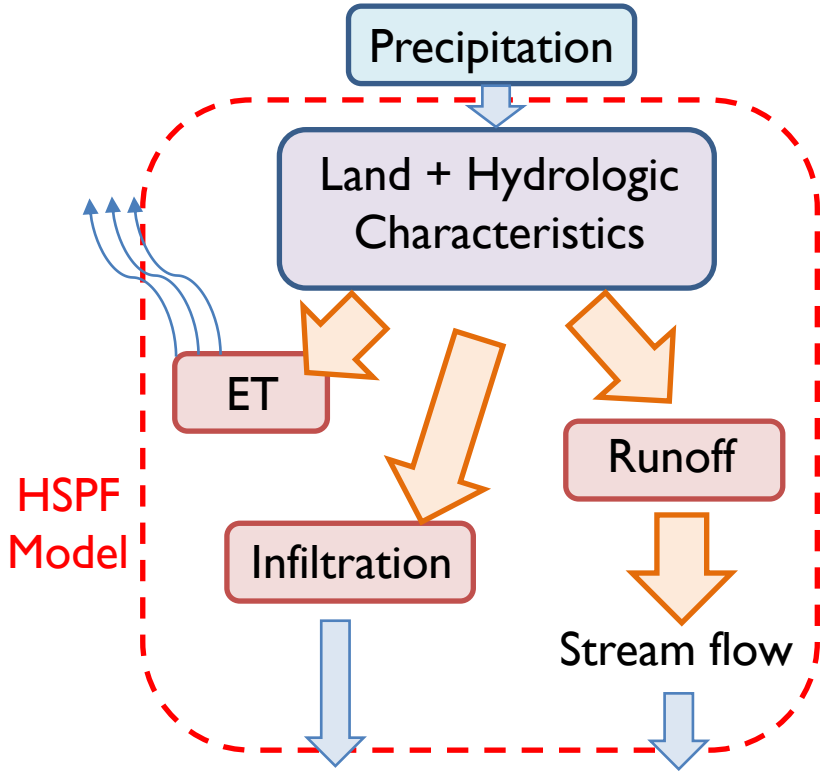

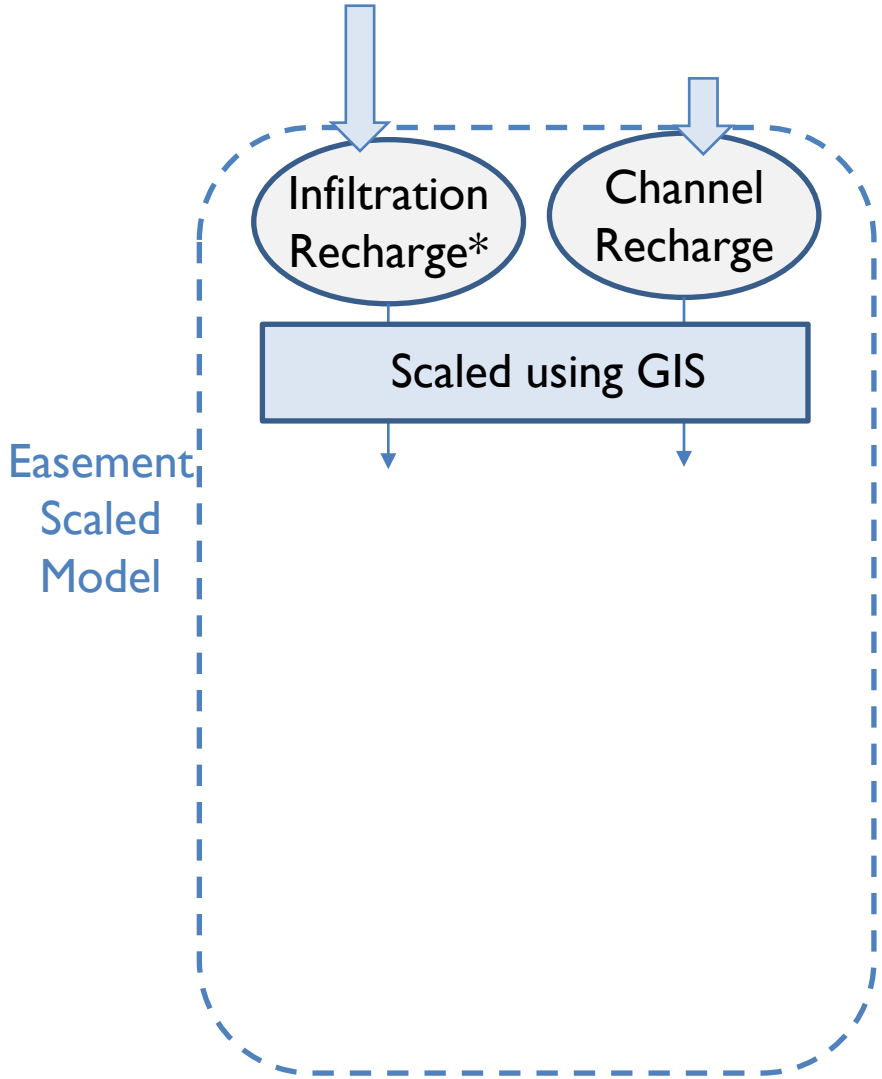

GIS tools are used to scale the results from watershed size to the size of individual properties

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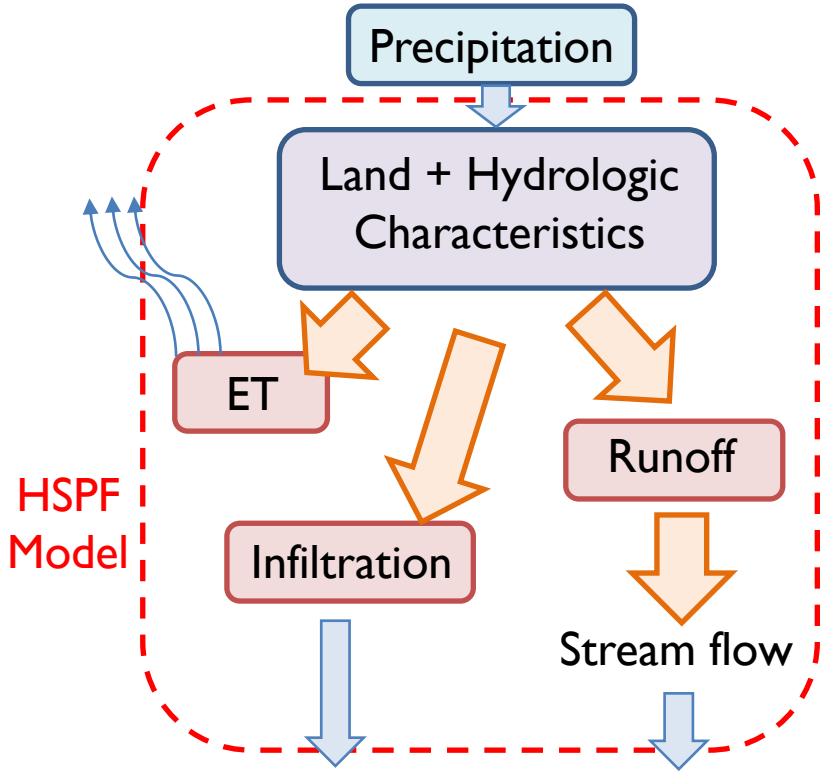
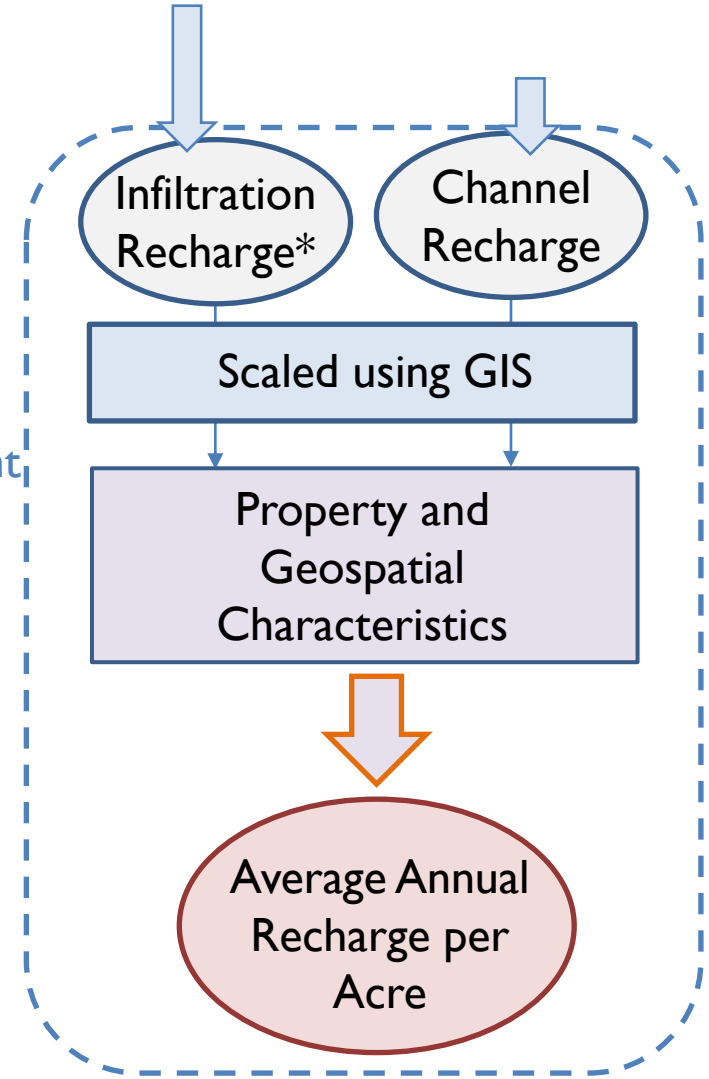


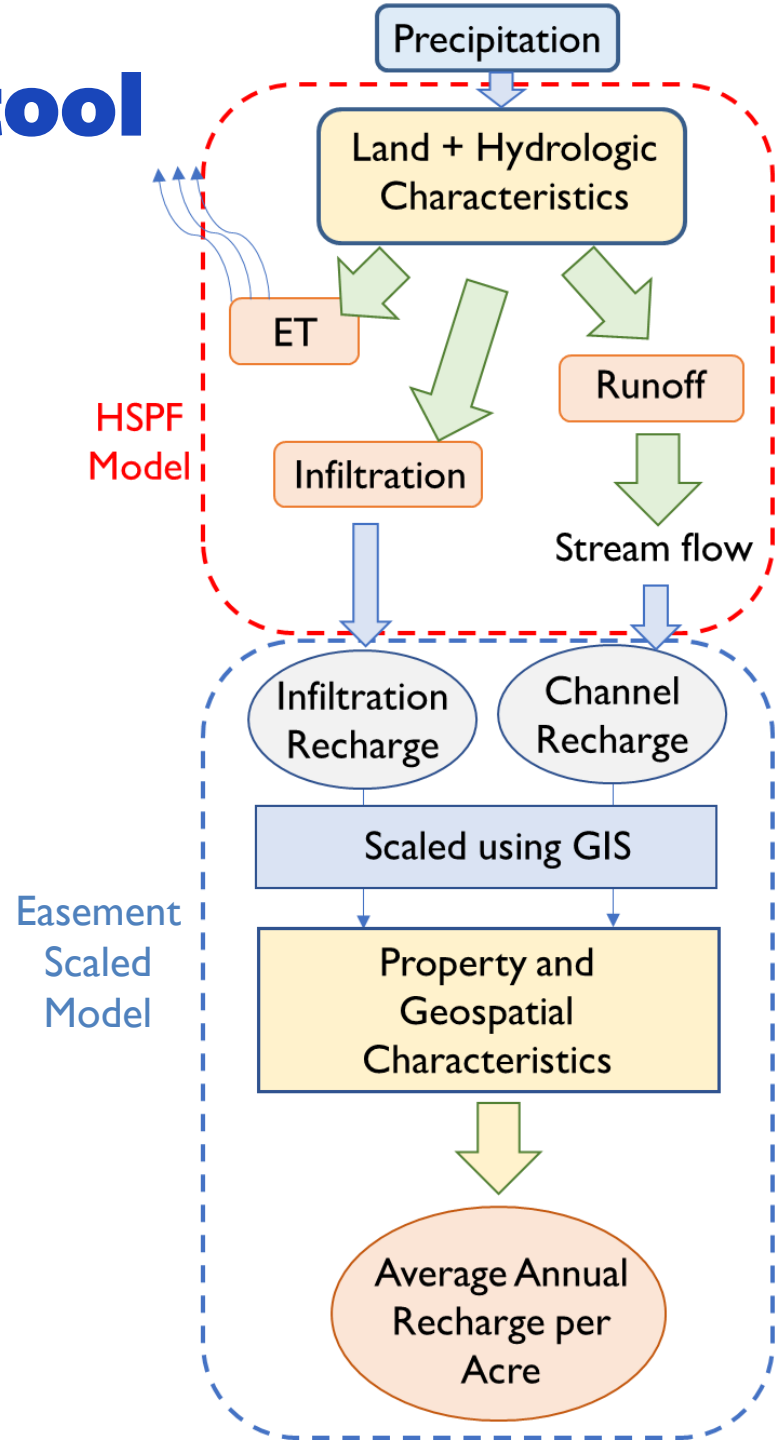
Spatial location, area, and other information are then used to calculate average annual recharge per acre for each property/easement



DRAFT MODEL CONCEPT

The recharge assessment tool

- Recharge per unit area can be used with cost and other factors to assess efficacy or guide future acquisitions
- Components of the model can be adjusted (e.g., land use changes)
- GIS integration can complement current EAPP tools (e.g., SET GIS model)
- The draft approach utilizes existing technology*
- SwRI's 2020 model demonstrated the feasibility of the approach



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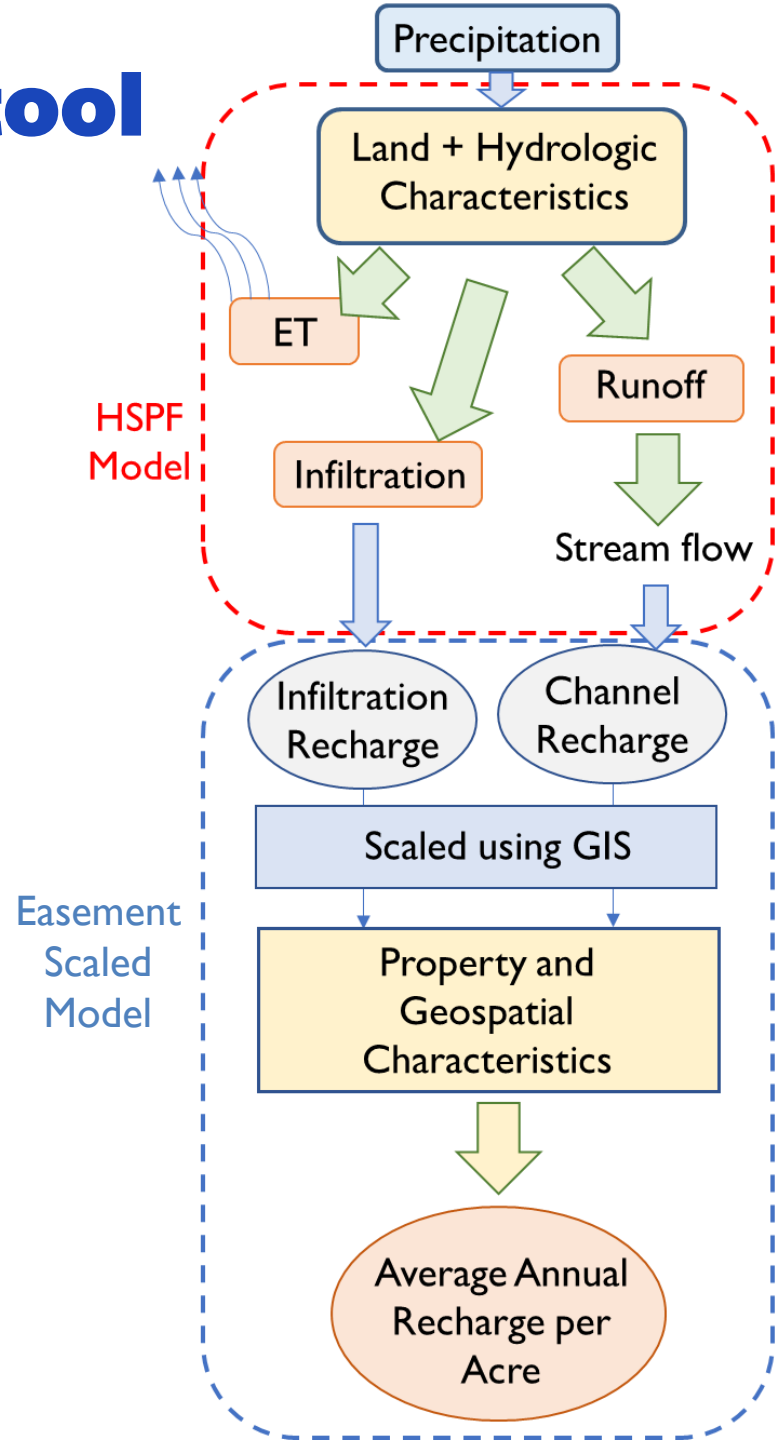
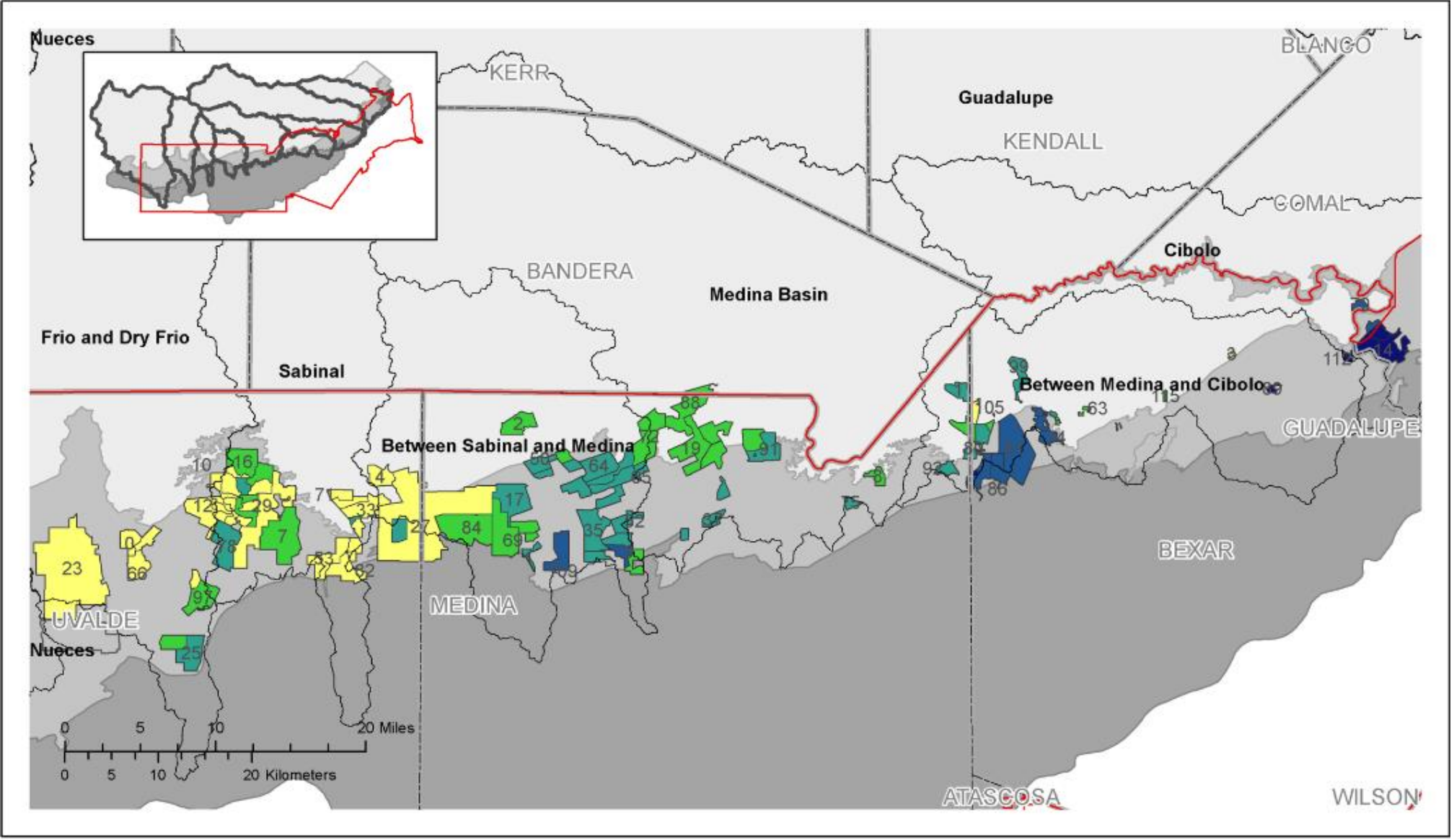
*during the past year alternative approaches (e.g., AI models) have emerged and may be more suitable





EAA Jurisdiciton

9 HSPF Basins

Averge Annual Recharge per Acre

LOWER HIGHER

Aquifer Zones

- Artesian Zone
- Drainage Area
- Recharge Zone

Results from the feasibility study

- Approach can be applied at the property scale
- Enough difference in "property performance" to make model effort worthwhile
- Still some technical challenges to overcome
- Many related applications – look back or look forward

Technical Challenges

- Infiltration and seepage components in HSPF are not linked to recharge in a technically defensible way
- A coupled, calibrated surface water–groundwater model does not exist for the Edwards Aquifer
- Still need specific information on magnitude and nature of interformational flow (CZ)
- Previous specific HSPF calibrations/parametrization for some sub-basins may be difficult to overcome

Path Forward

- EAA will proceed with development of a full model/tool
- Will include all EAA-related basins east to west
- Will incorporate/leverage information from other modeling efforts
  - Coupled model development in Blanco River basin
  - Calibration and conversion to "new" HSPF code used as part of EAA's climate change assessment
  - Compatible or inclusive of many SET GIS model features
  - Recent knowledge regarding AI models and their effectiveness
- Approximately 18 to 24 months to complete
- Time to include scope changes and other interoperability components