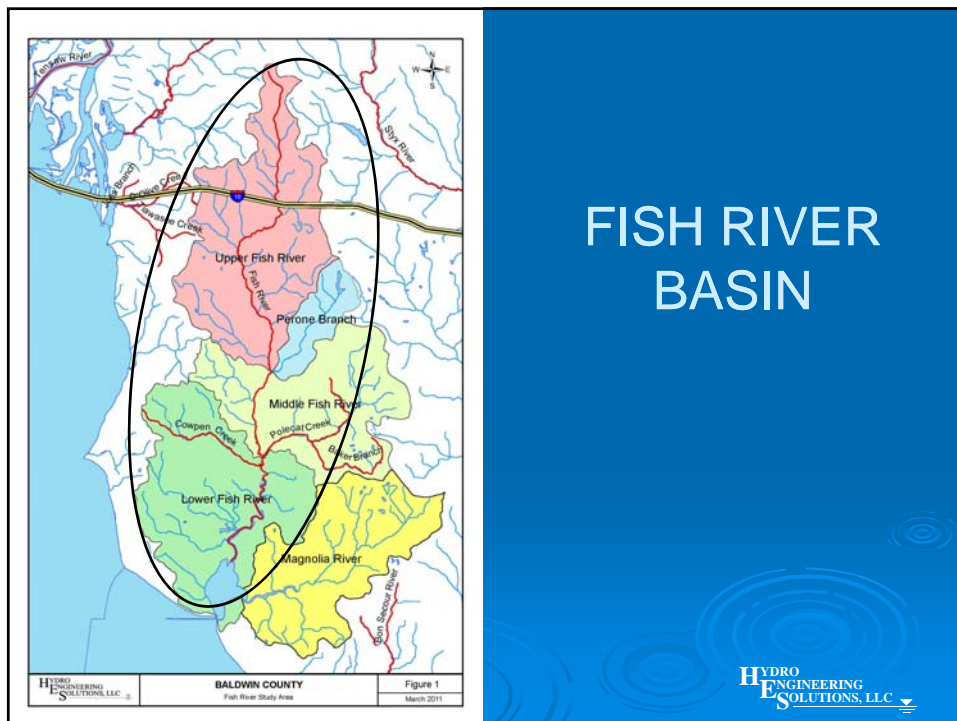


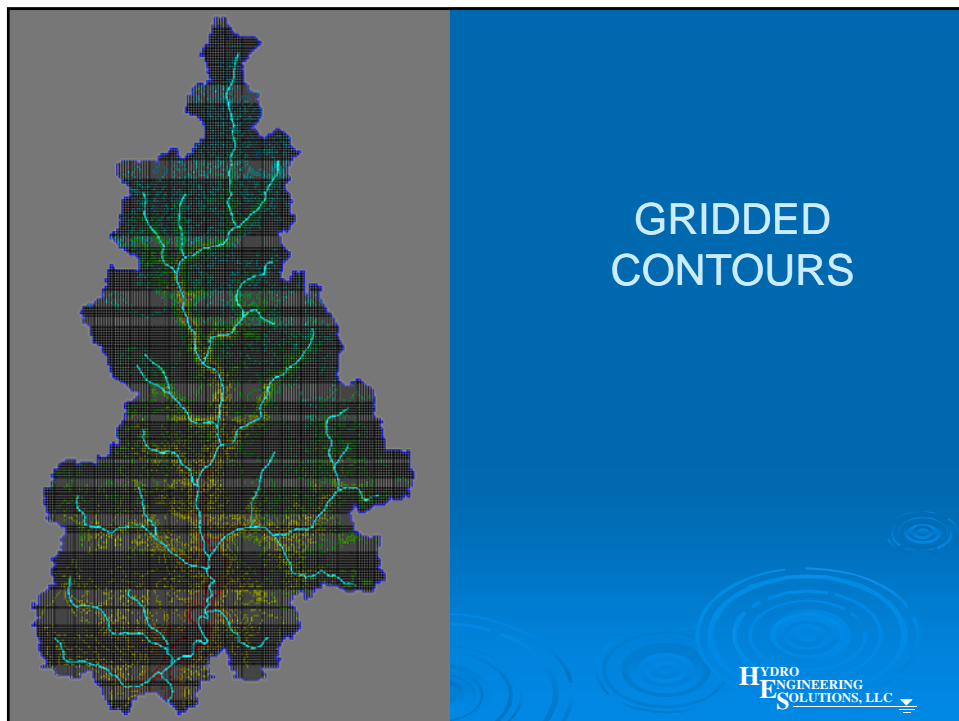
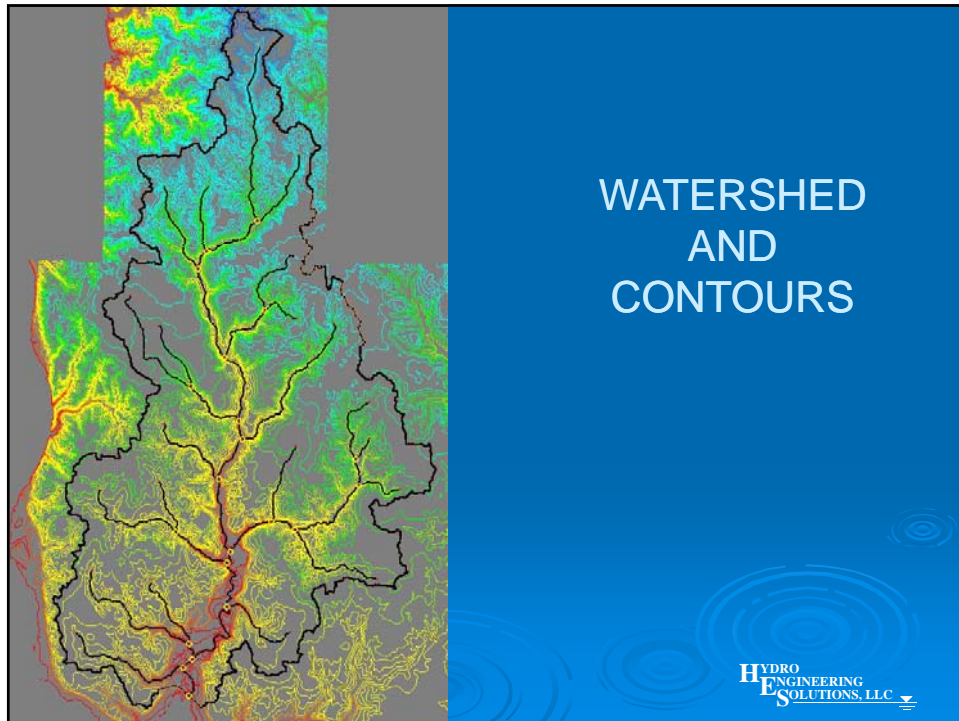
# FISH RIVER AND MAGNOLIA RIVER WATERSHED STUDY

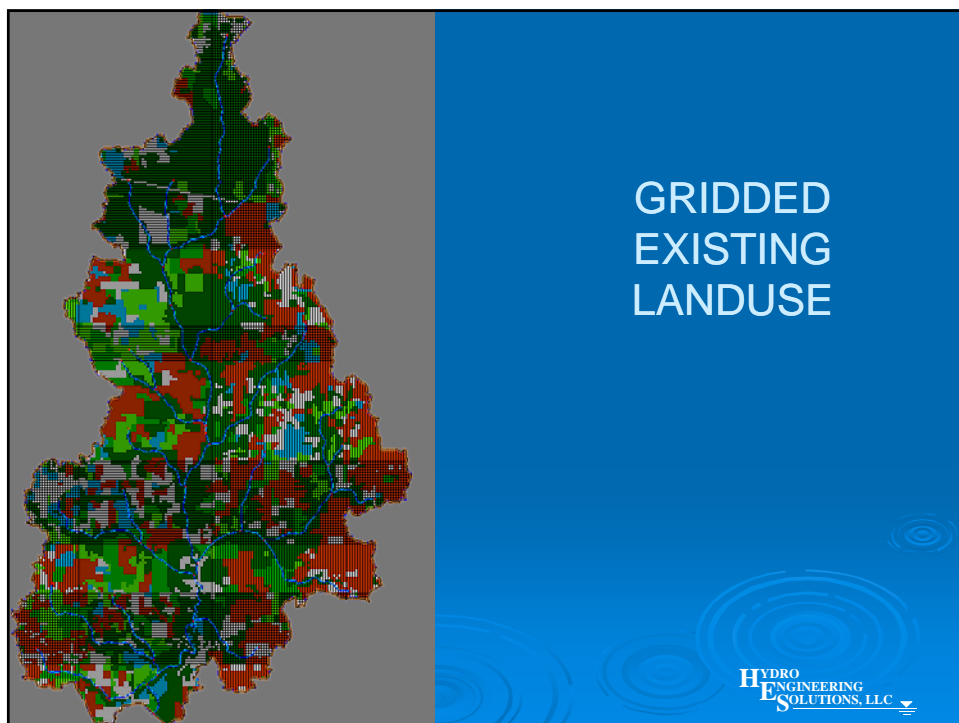
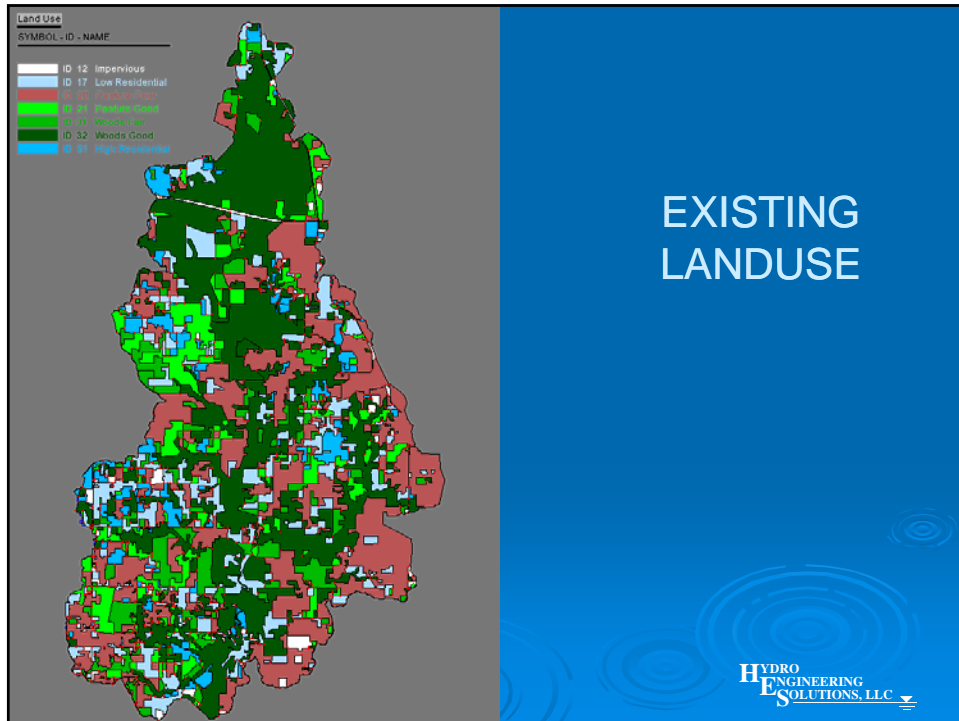
15 NOVEMBER 2011

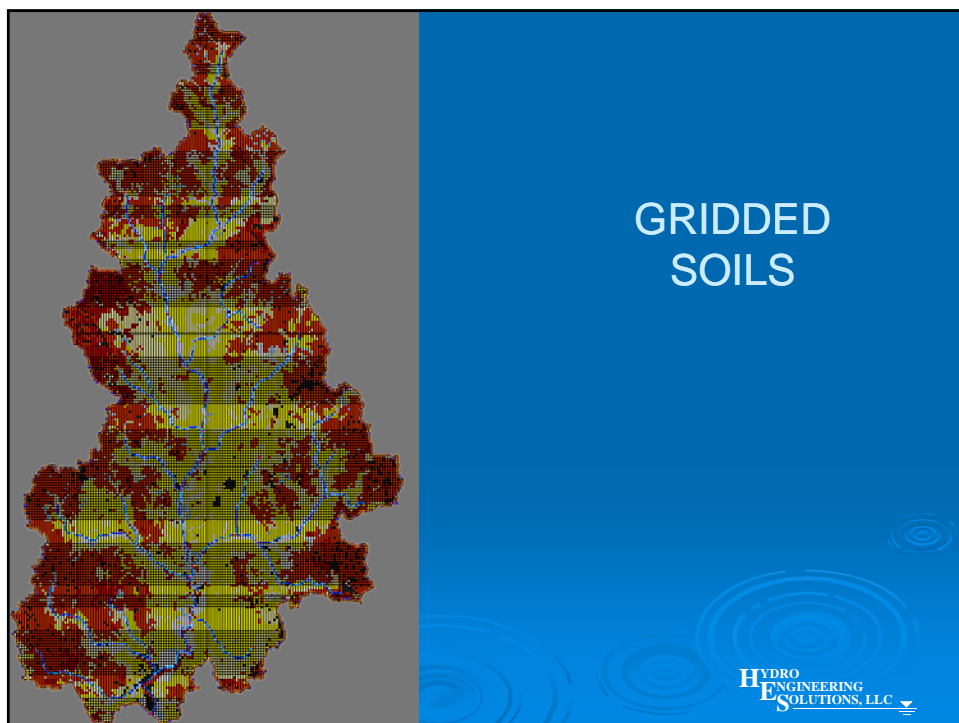
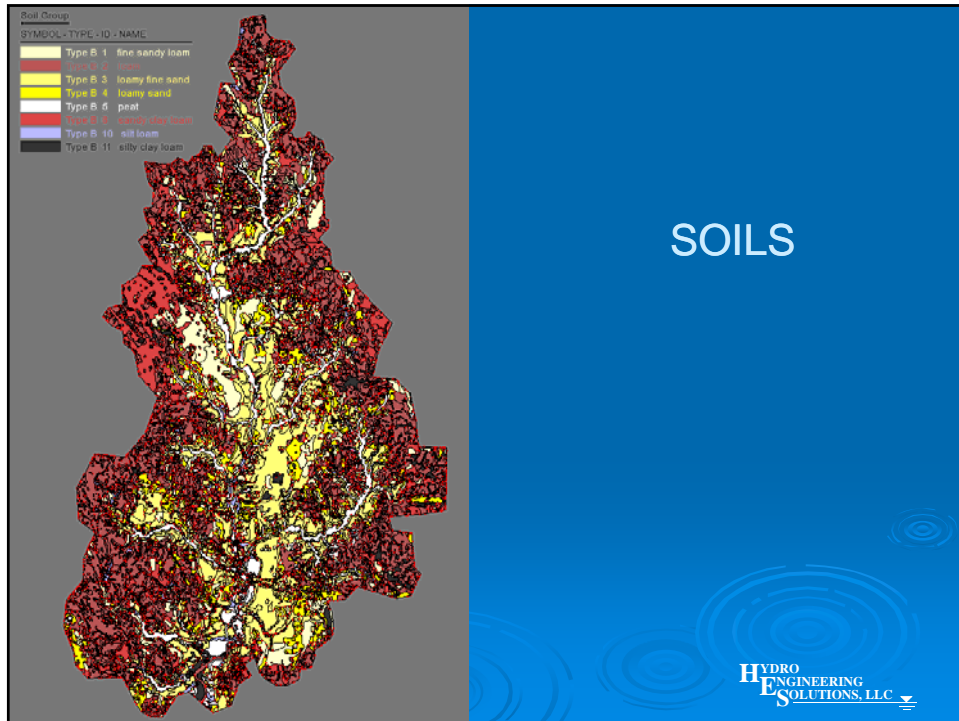
By:  
John E. Curry, P.E.  
And  
JT Thomas, P.E.

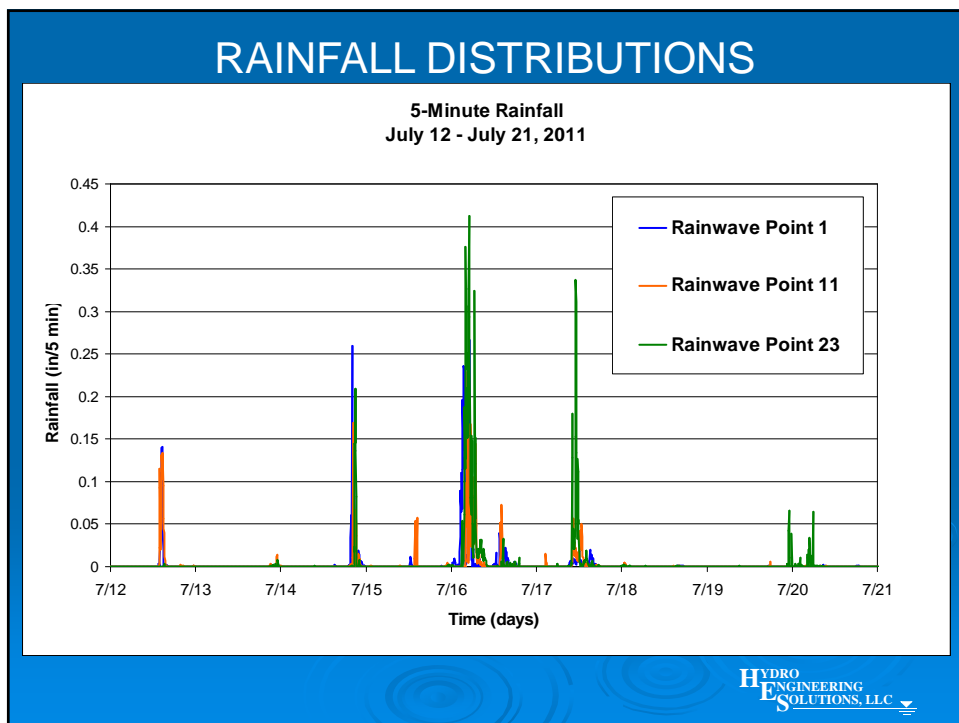
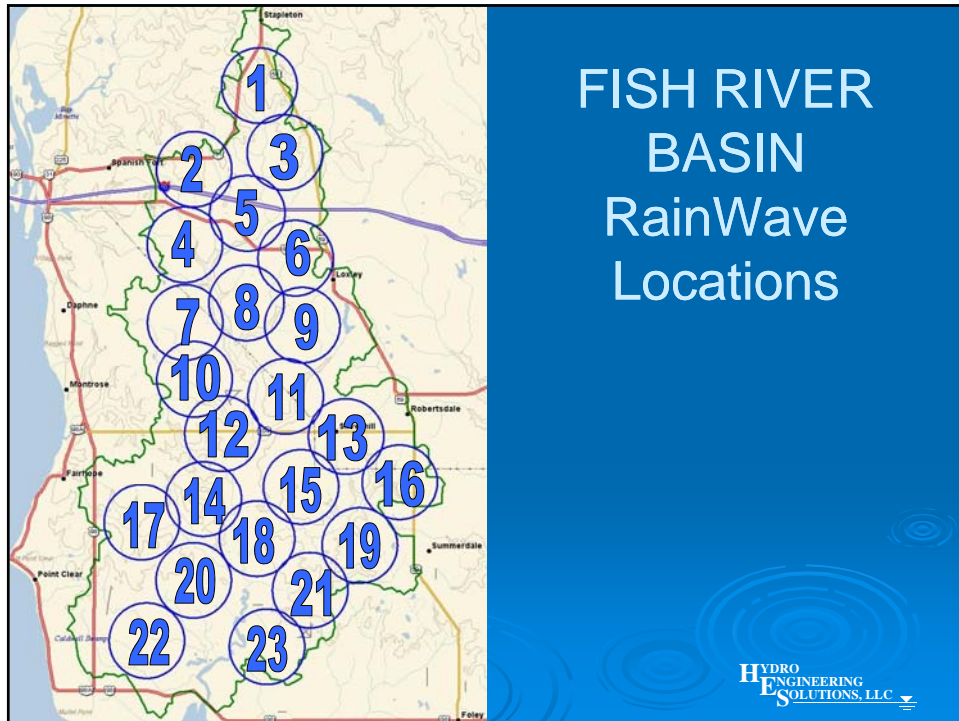
HYDRO  
ENGINEERING  
SOLUTIONS, LLC



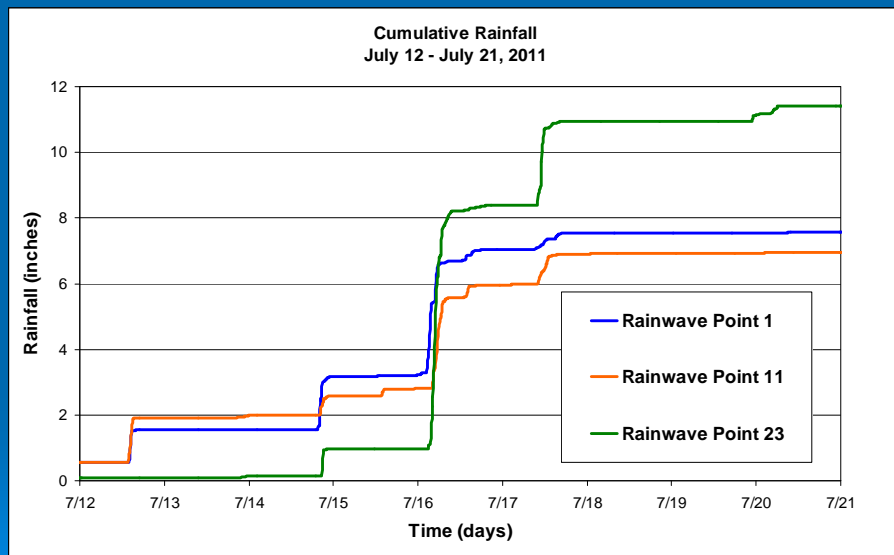






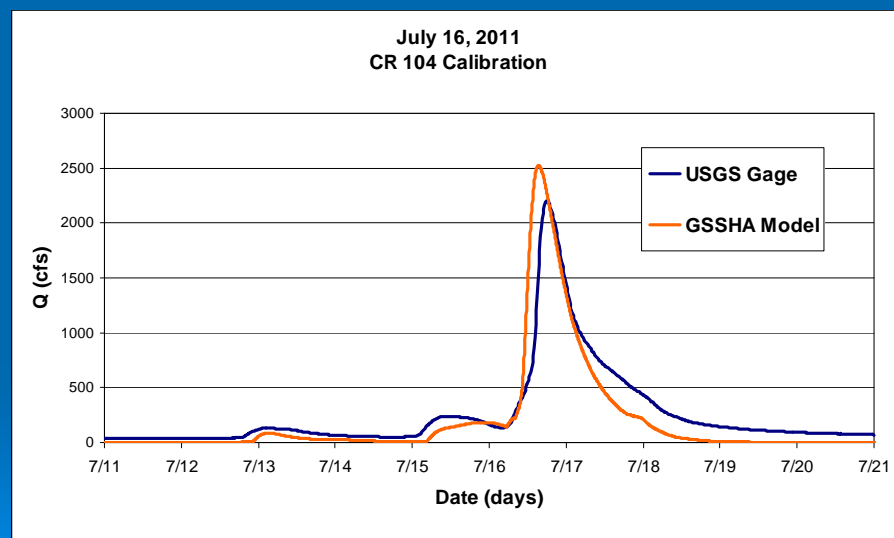


## RAINFALL DISTRIBUTIONS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## CALIBRATED MODEL

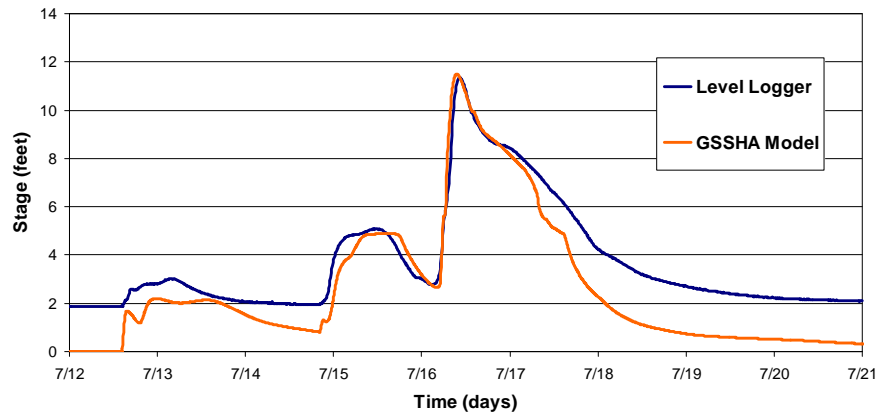


HYDRO  
ENGINEERING  
SOLUTIONS, LLC



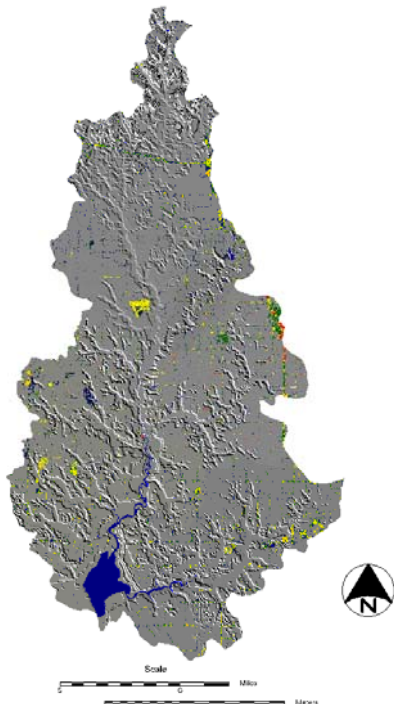
## CALIBRATED MODEL

July 16, 2011  
CR 64 Calibration

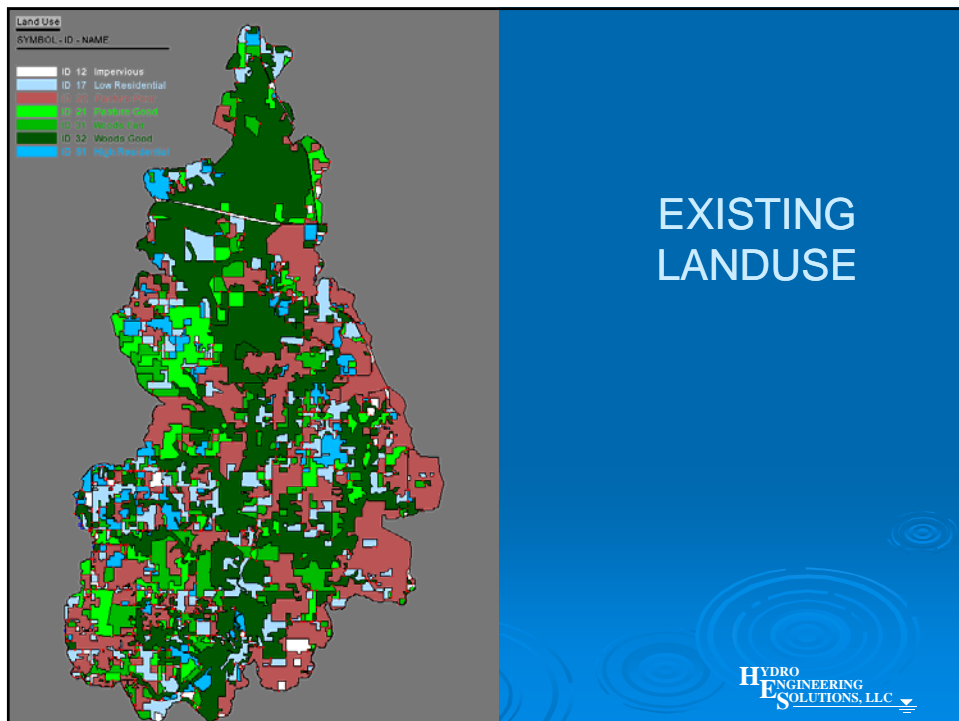
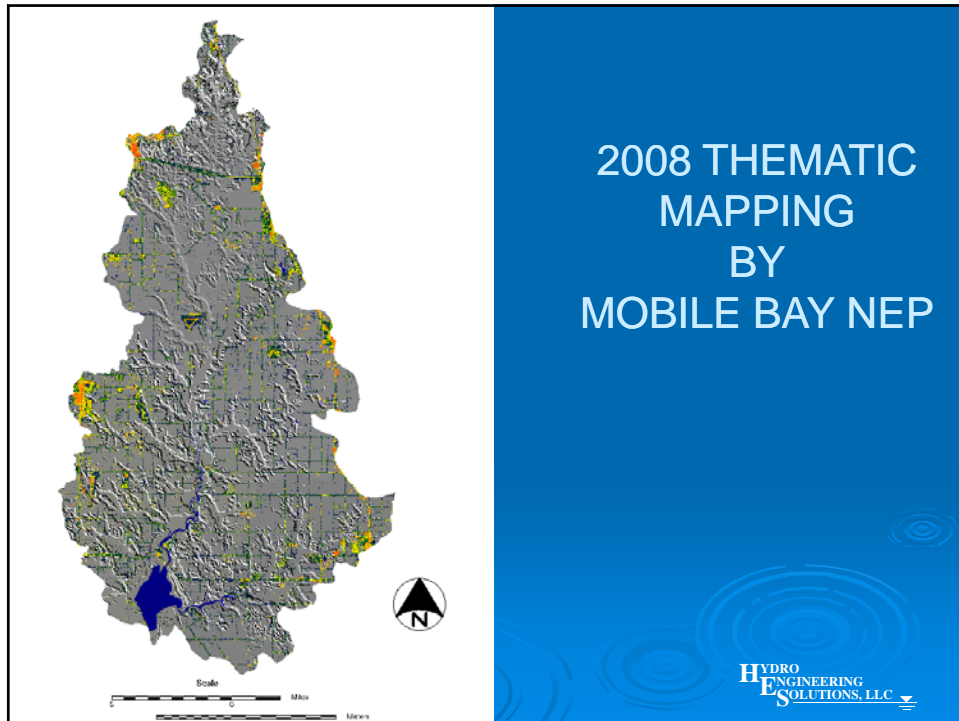


HYDRO  
ENGINEERING  
SOLUTIONS, LLC

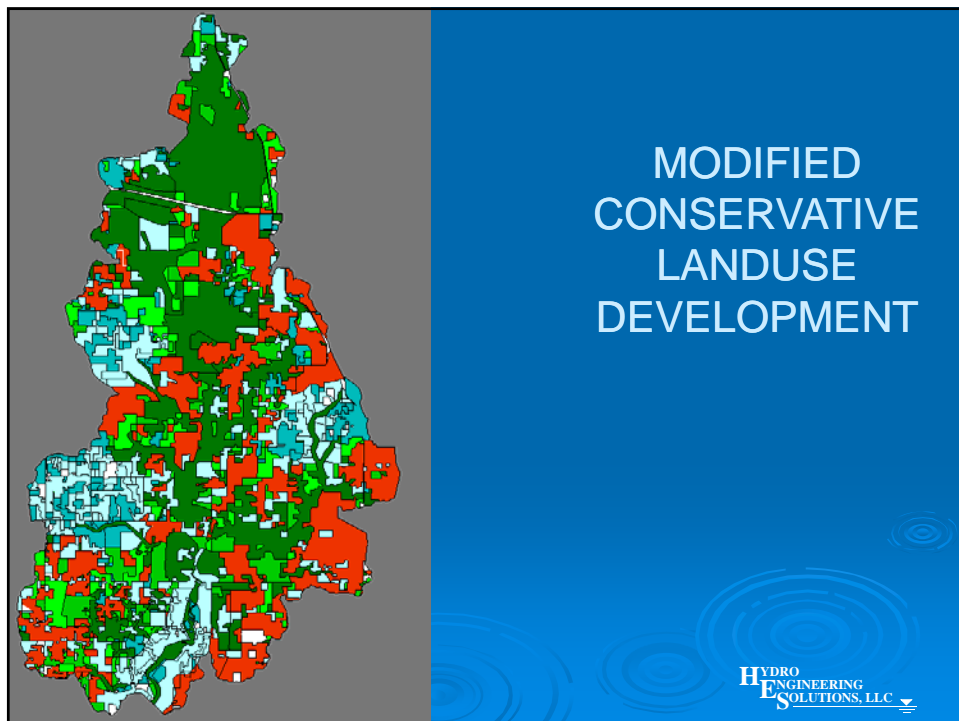
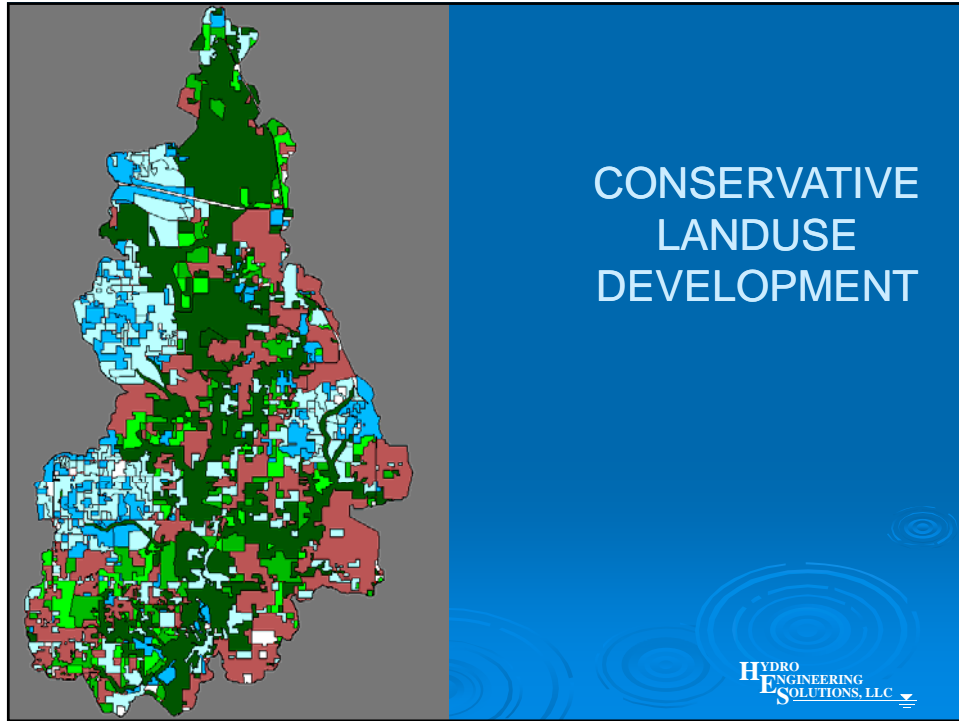
## 1974 SPECTRAL MAPPING MOBILE BAY NEP



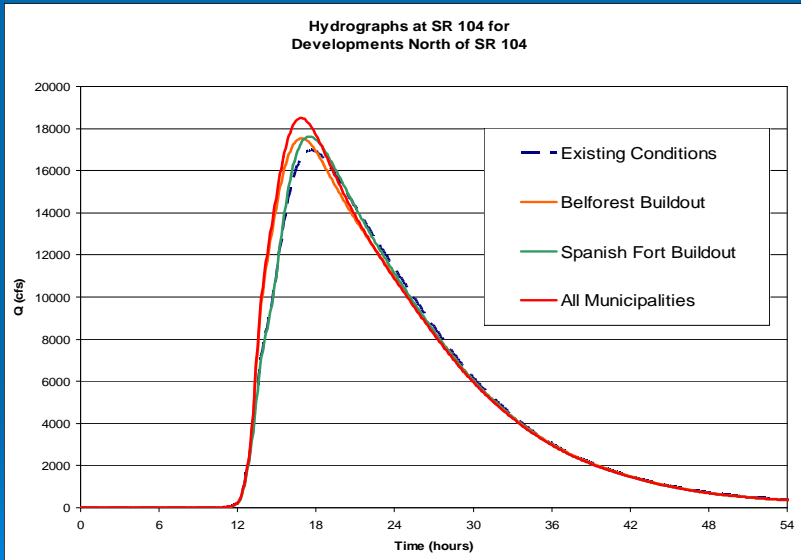
HYDRO  
ENGINEERING  
SOLUTIONS, LLC





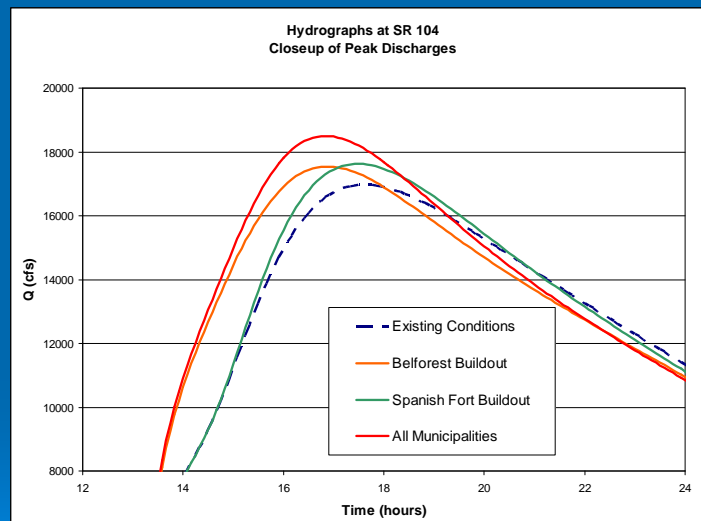


## DEVELOPMENT HYDROGRAPHS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

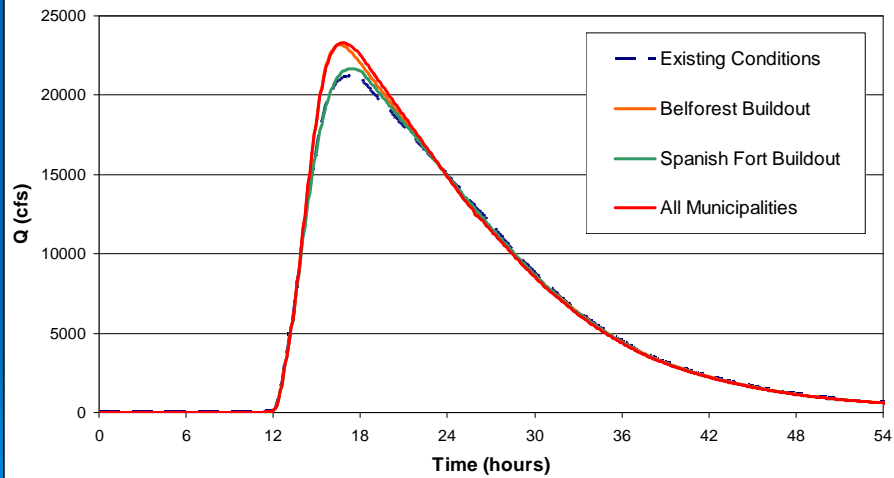
## DEVELOPMENT HYDROGRAPHS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS

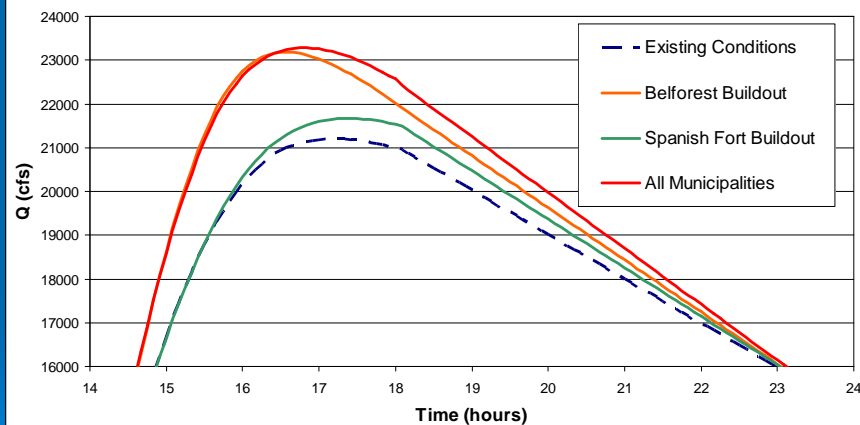
Hydrographs at CR 48 for  
Developments North of CR 48



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

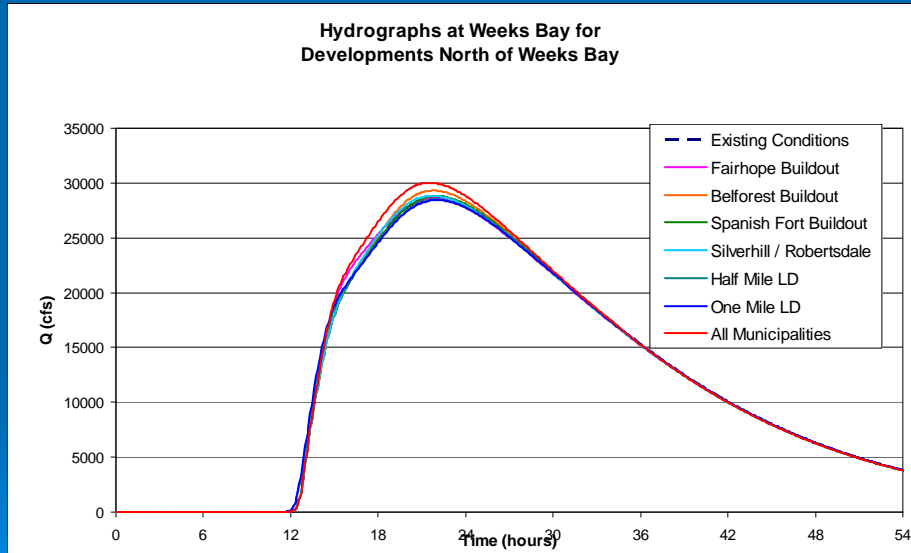
## DEVELOPMENT HYDROGRAPHS

Hydrographs Just Downstream of CR 48 for  
Closeup of Peak Discharges



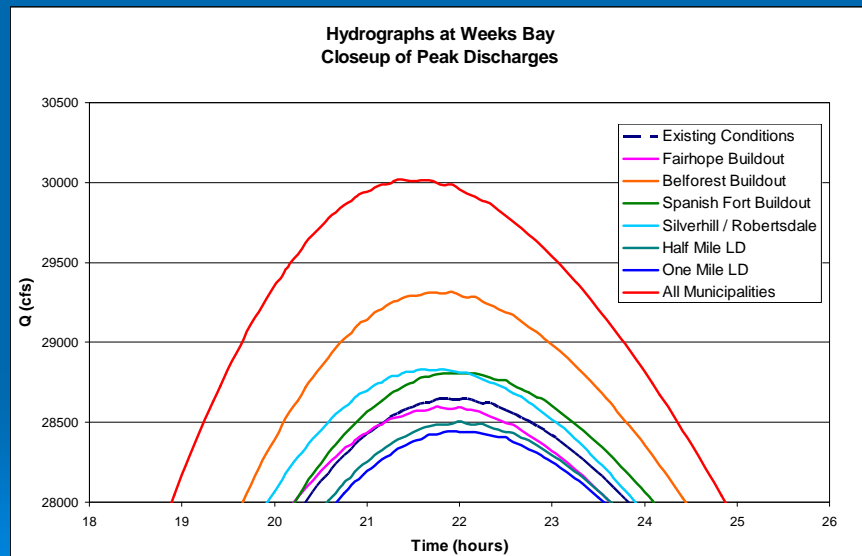
HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC



## WHAT WE LEARNED

- THE FURTHER IN THE HEADWATERS THE DEVELOPMENT OCCURS THE WORSE THE IMPACT ON FISH RIVER

## WHAT WE LEARNED CONT'D

- CORN BRANCH POND COUPLED WITH FISH RIVER POND C IS A BENEFICIAL COMBINATION FOR HELPING REDUCE PEAK DISCHARGES

HYDRO  
ENGINEERING  
SOLUTIONS, LLC





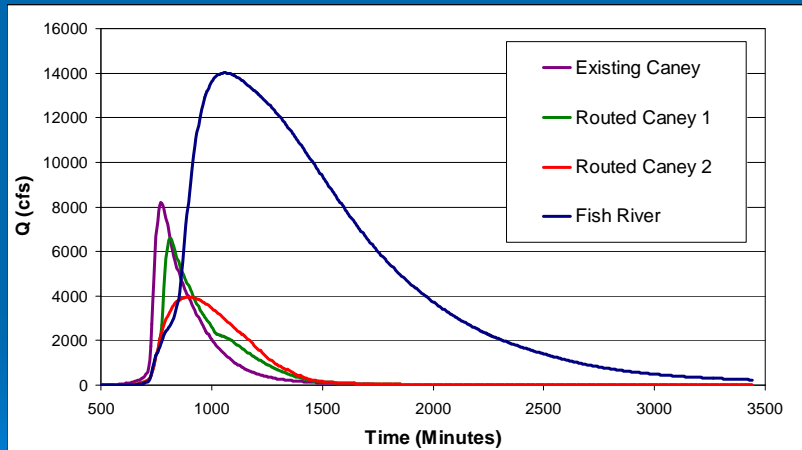
## WHAT WE LEARNED CONT'D

- CANEY BRANCH SMALL POND, CANEY BRANCH BIG POND, AND PICARD BRANCH ALL CAUSED AN INCREASE ON FISH RIVER DUE TO TIMING

HYDRO  
ENGINEERING  
SOLUTIONS, LLC

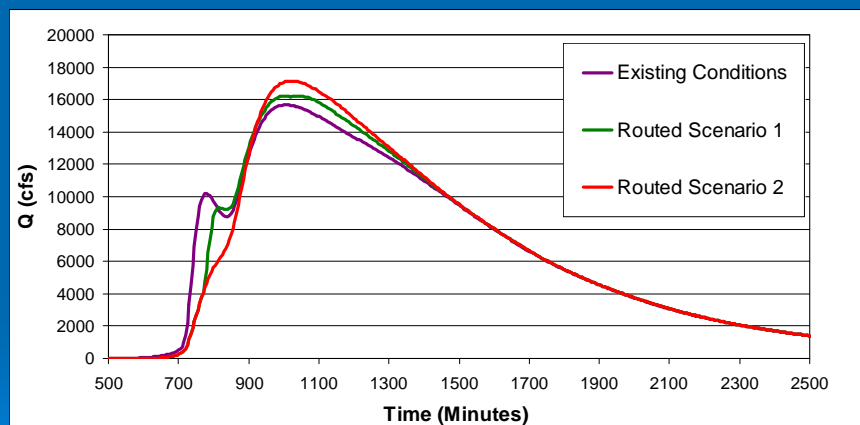


## CANEY BRANCH BIG POND



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## SUM OF FISH RIVER AND CANEY BRANCH BIG POND

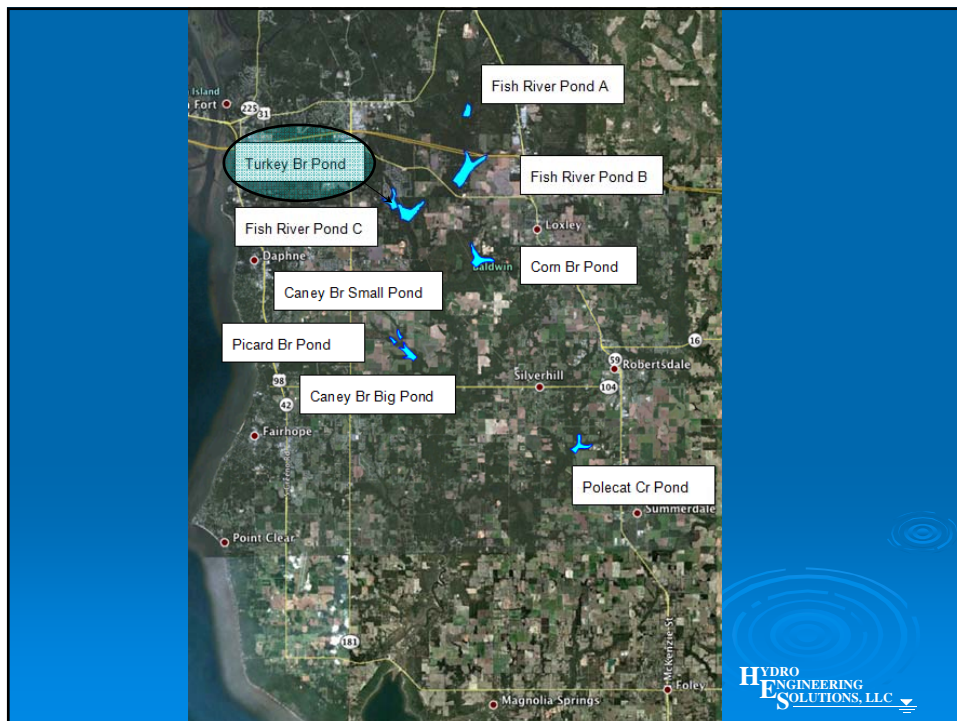


HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## WHAT WE LEARNED CONT'D

- TURKEY BRANCH POND COUPLED WITH SPANISH FORT DETENTION CAUSED A DECREASE AT SR104 BUT AN INCREASE DOWNSTREAM OF CR48 DUE TO TIMING

HYDRO  
ENGINEERING  
SOLUTIONS, LLC



## WHAT WE LEARNED CONT'D

- FISH RIVER “POND A” HAD VIRTUALLY NO IMPACT ON THE REDUCTION OF PEAK DISCHARGES FOR EXISTING AND PROPOSED DEVELOPMENT.
- FISH RIVER “POND B” PROVIDES MINIMAL REDUCTION IN INCREASED DISCHARGES FOR PROPOSED DEVELOPMENT

HYDRO  
ENGINEERING  
SOLUTIONS, LLC



## WHAT WE LEARNED CONT'D

- LOCAL DETENTION IN THE UPPER PART (SPANISH FORT...ETC) OF WATERSHED IS REQUIRED TO HELP OFFSET INCREASED DISCHARGES DUE TO DEVELOPMENT IN OTHER PARTS OF THE WATERSHED

HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## WHAT WE LEARNED CONT'D

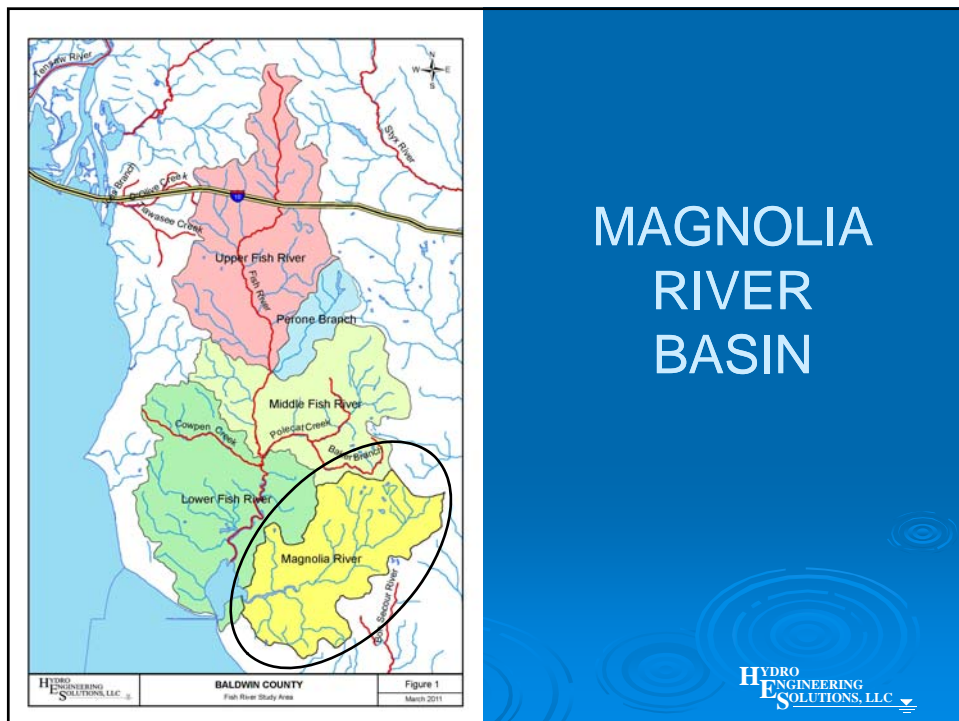
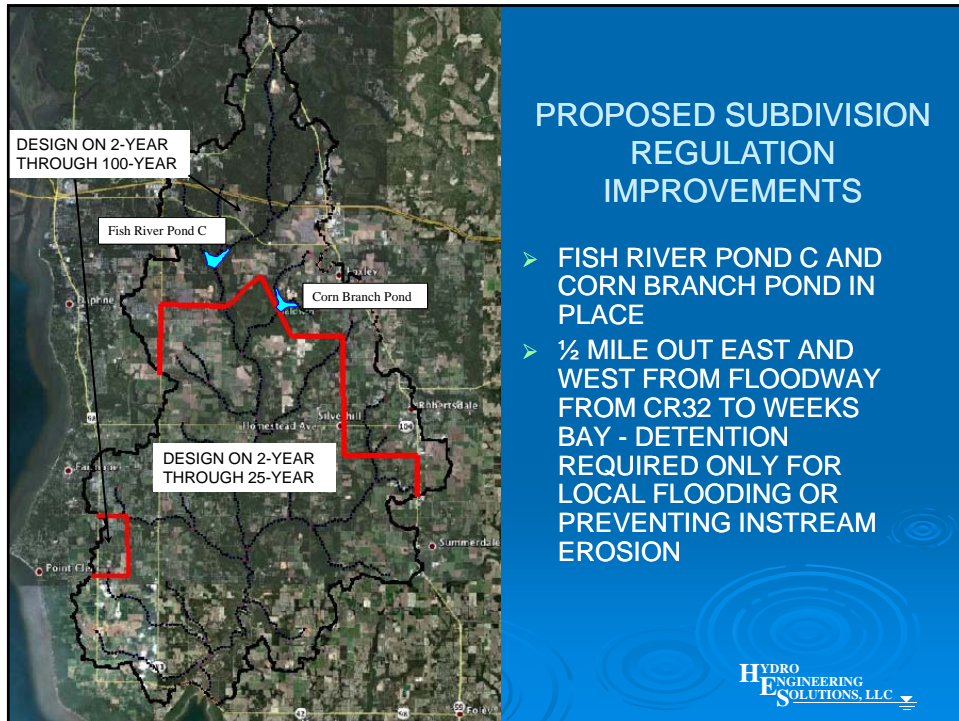
- DEVELOPMENT WITHIN A HALF MILE OF THE FLOODWAY IN THE LOWER PART OF THE BASIN CAN BE LEFT UNDETAINED
- IT MAY BE NECESSARY TO DESIGN LOCAL DETENTION/RETENTION TO PROTECT LOCAL STREAMS OR IF THERE IS A LOCAL FLOODING ISSUE DOWNSTREAM OF THE PROPERTY

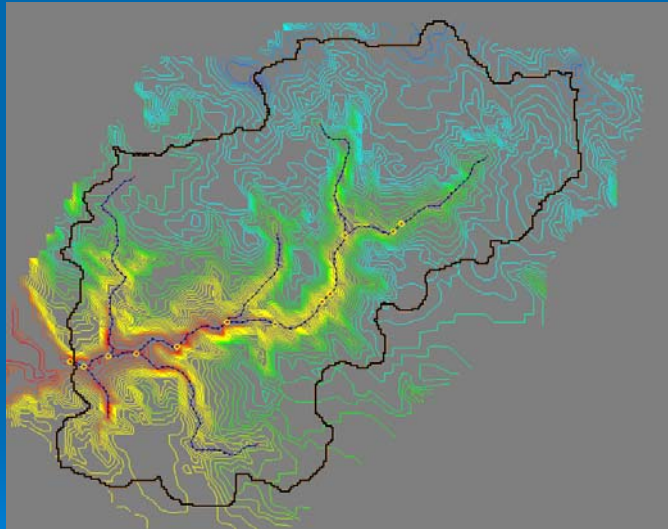
HYDRO  
ENGINEERING  
SOLUTIONS, LLC



Fish River Watershed Summary of Discharges				
SCENARIO		SR 104	D.S. of CR 48	HWY 98
Existing Conditions		16,960	21,190	28,640
F+B+S/R+SpFt Developed		18,240	23,280	29,620
F+B+S/R+SpFt Developed – Add Fish River Pond B		18,140	23,270	29,540
F+B+S/R+SpFt Developed – Add Com Branch Pond		17,650	22,100	29,320
F+B+S/R+SpFt Developed – Add Caney Branch Pond		18,500	22,430	29,110
F+B+S/R Developed, SpFt All Local Detention Add Turkey Branch Pond		16,440	22,590	29,220
F+B+S/R+L Developed F+B Headwater Detention SpFt All Local Detention		17,050	22,060	29,000
F+B+S/R+L Developed F+B Headwater Detention SpFt All Local Detention Add Com Br Pond		16,690	20,880	28,700
F = Fairhope Area    B = Belforest Area    S/R = Silverhill/Robertsdale Area    SpFt = Spanish Fort L = Area along Fish River below CR 32 and above HWY 98				

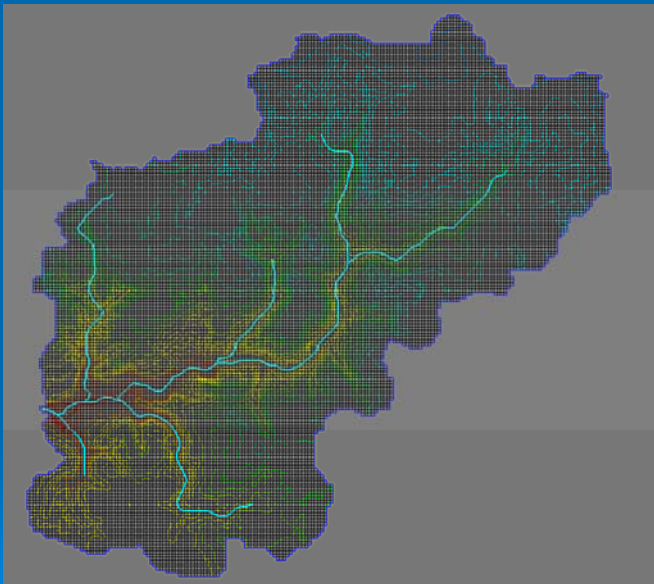






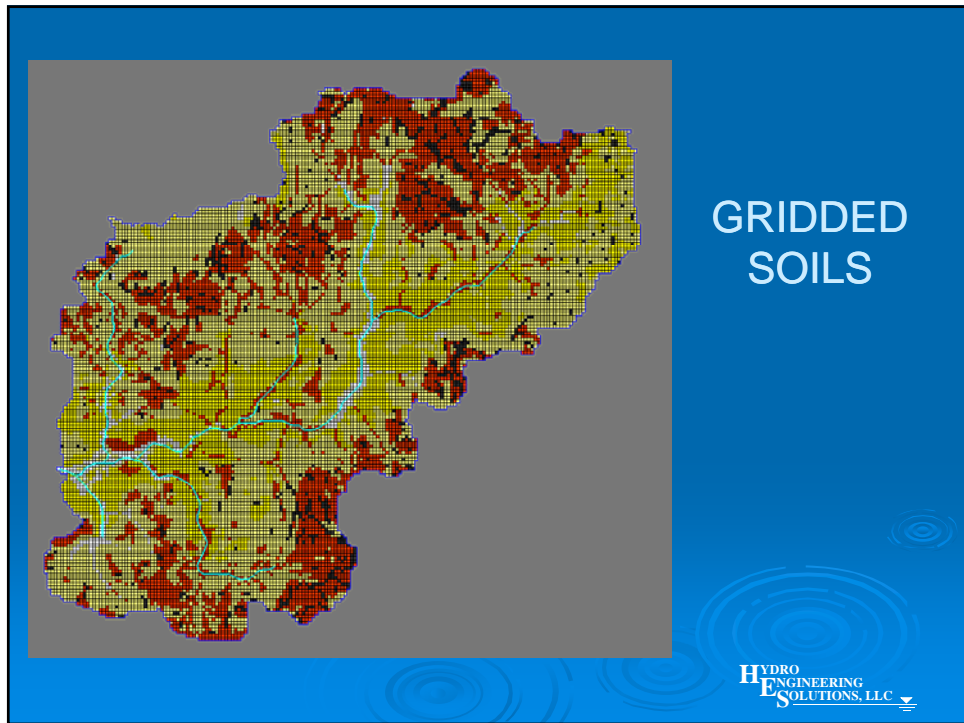
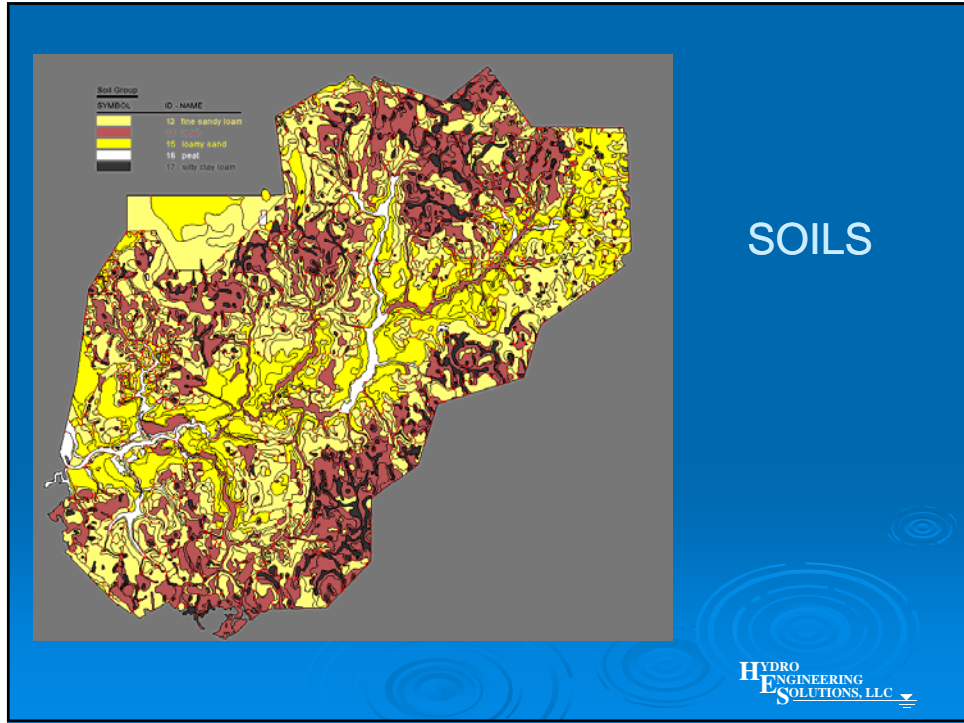
## WATERSHED AND CONTOURS

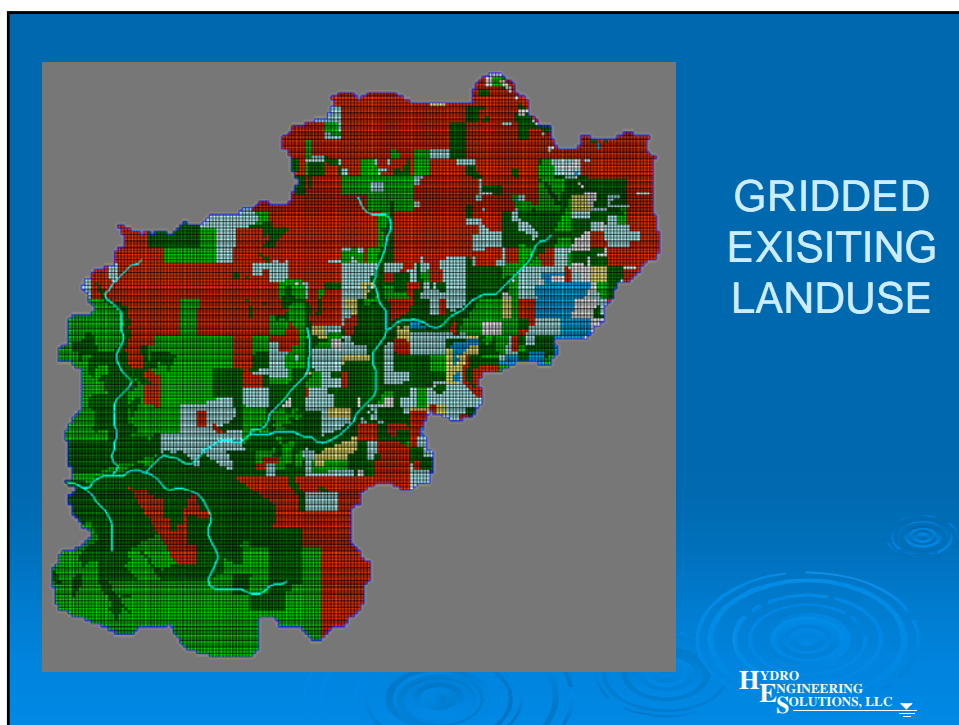
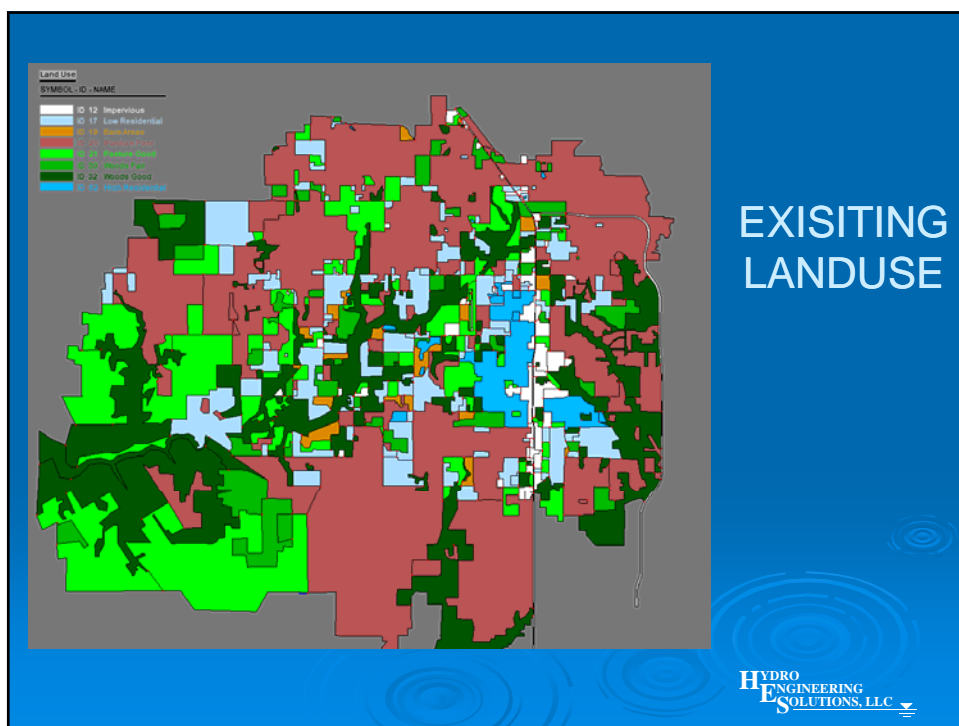
HYDRO  
ENGINEERING  
SOLUTIONS, LLC



## GRIDDED CONTOURS

HYDRO  
ENGINEERING  
SOLUTIONS, LLC

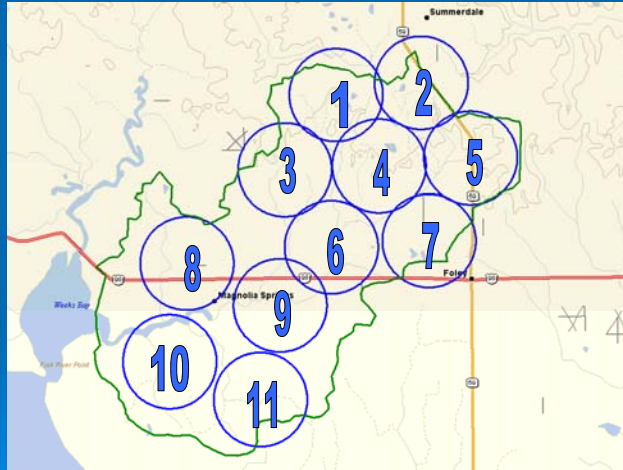






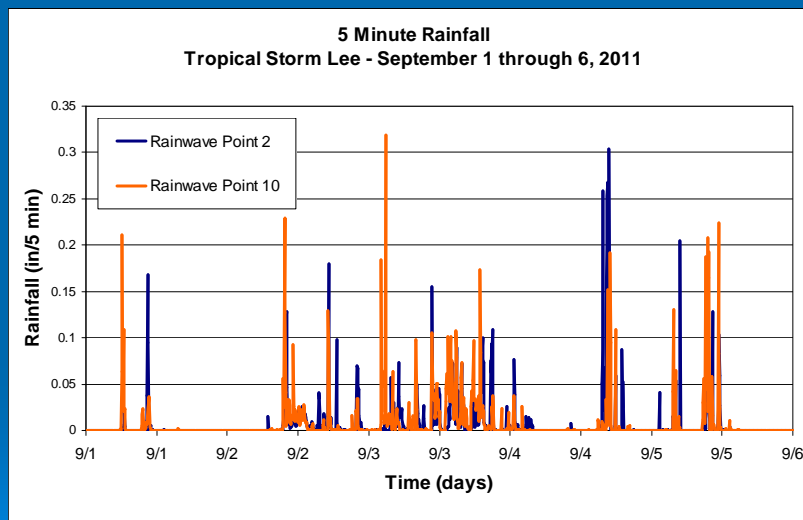
# MAGNOLIA RIVER BASIN

## RainWave Locations



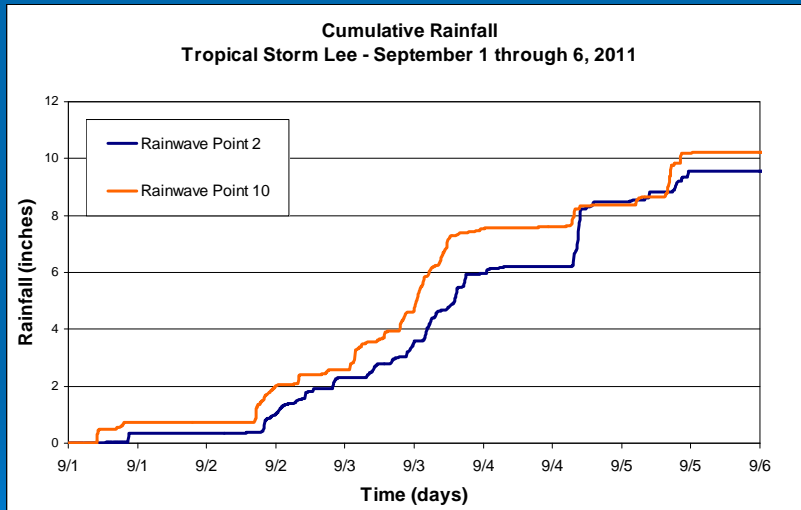
HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## RAINFALL DISTRIBUTIONS



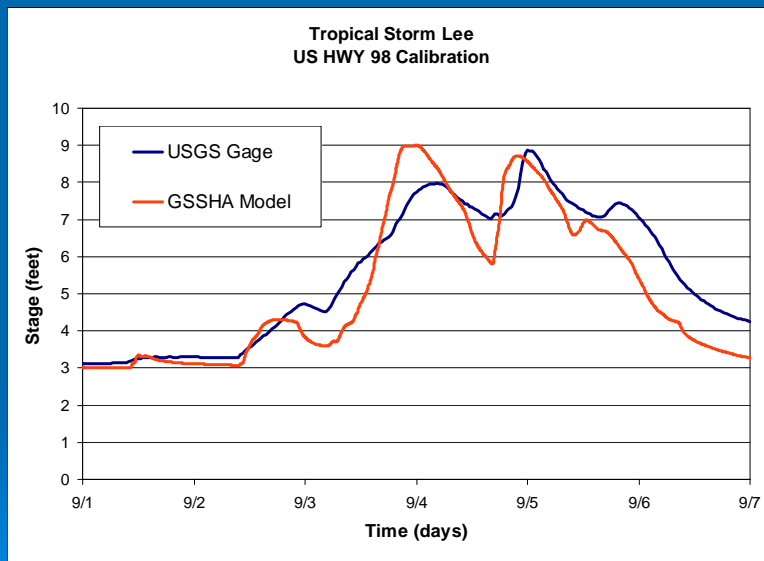
HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## RAINFALL DISTRIBUTIONS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

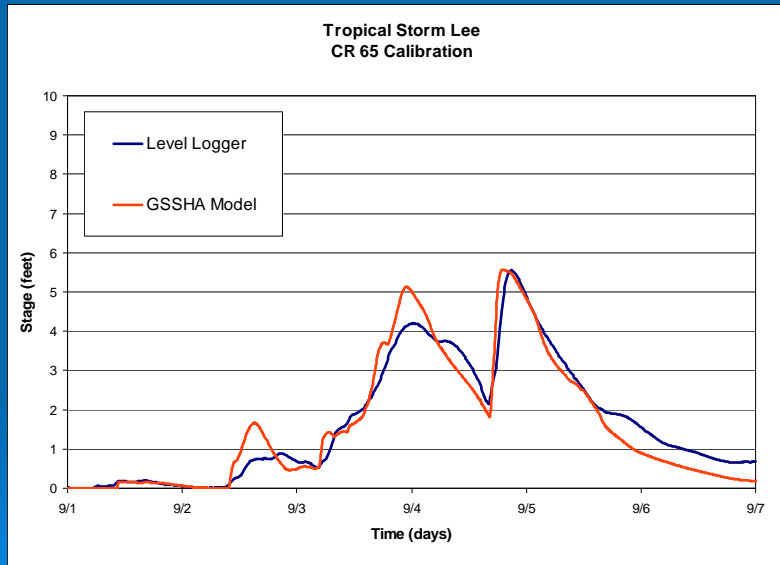
## CALIBRATED MODEL



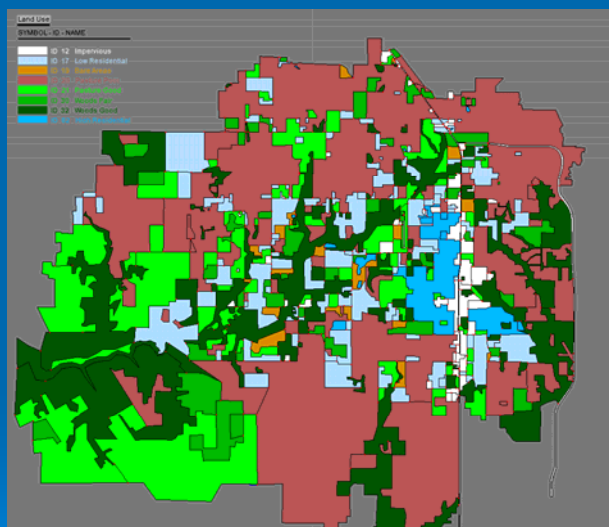
HYDRO  
ENGINEERING  
SOLUTIONS, LLC



## CALIBRATED MODEL

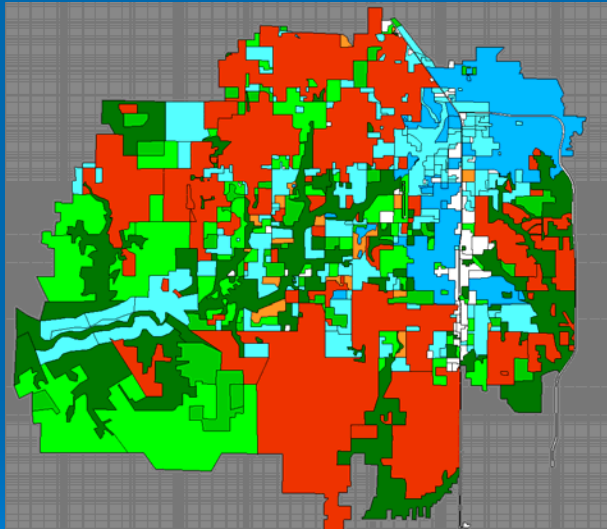


HYDRO  
ENGINEERING  
SOLUTIONS, LLC



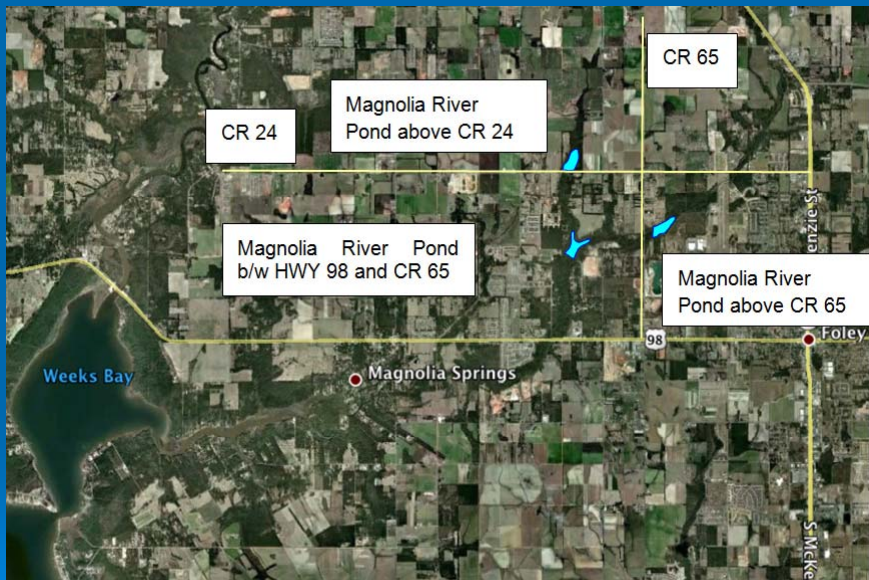
LANDUSE  
DEVELOPMENT

HYDRO  
ENGINEERING  
SOLUTIONS, LLC



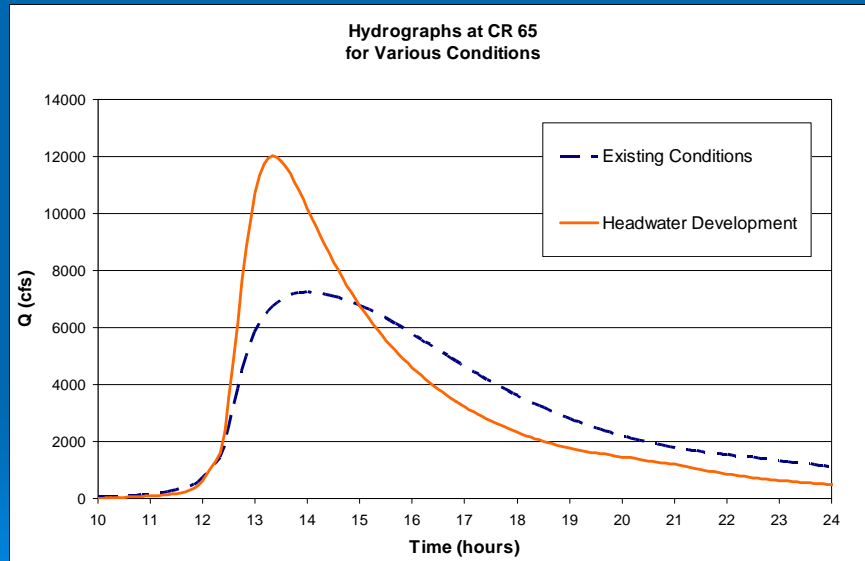
## CONSERVATIVE LANDUSE DEVELOPMENT

HYDRO  
ENGINEERING  
SOLUTIONS, LLC



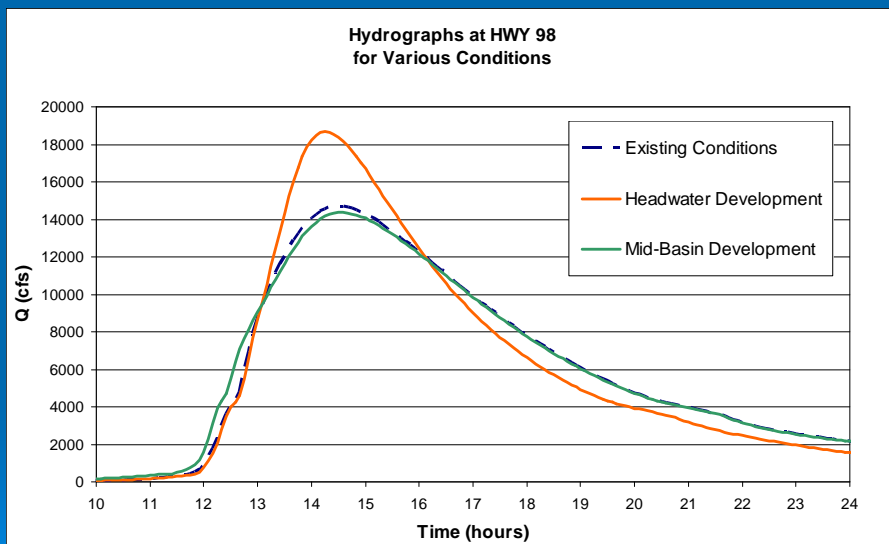
HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS



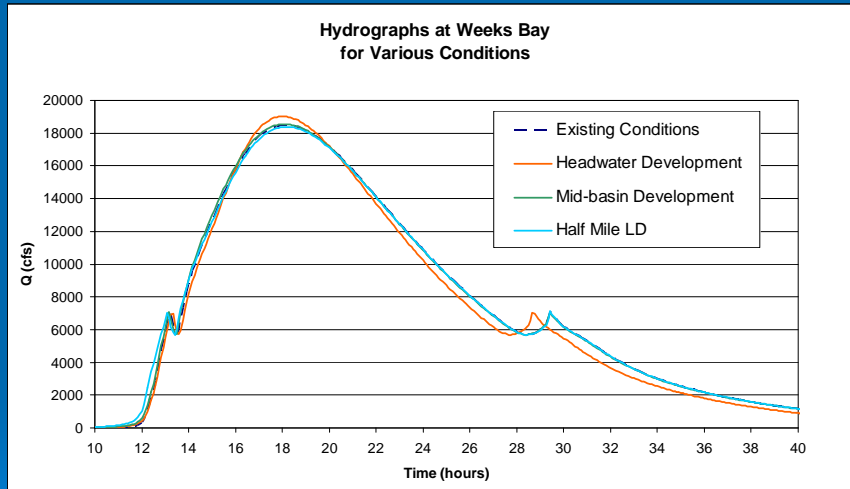
HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS



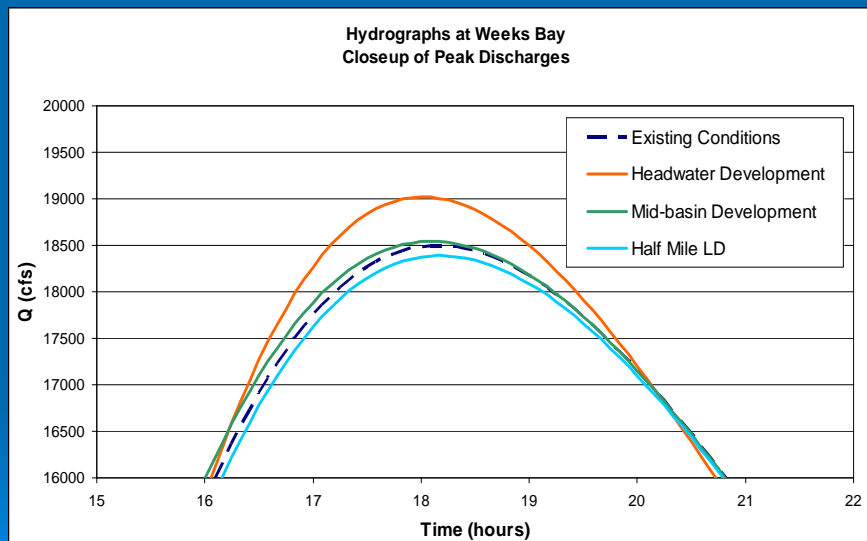
HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## DEVELOPMENT HYDROGRAPHS



HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## WHAT WE LEARNED

- THE FURTHER IN THE HEADWATERS THE WORSE THE IMPACT ON MAGNOLIA RIVER

HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## WHAT WE LEARNED CONT'D

- REGIONAL PONDS CANNOT PROVIDE ENOUGH STORAGE VOLUME TO HAVE A SIGNIFICANT IMPACT ON DISCHARGE REDUCTION
- REGIONAL PONDS WOULD BE UNABLE TO HANDLE INCREASED DISCHARGE DUE TO UNDETAINED DEVELOPMENTS

HYDRO  
ENGINEERING  
SOLUTIONS, LLC

## WHAT WE LEARNED CONT'D

- DEVELOPMENT WITHIN A HALF MILE OF THE FLOODWAY IN THE LOWER PART OF THE BASIN CAN BE LEFT UNDETAINED
- IT MAY BE NECESSARY TO DESIGN LOCAL DETENTION/RETENTION TO PROTECT LOCAL STREAMS OR IF THERE IS A LOCAL FLOODING ISSUE DOWNSTREAM OF THE PROPERTY

**Table 5-2**  
**Magnolia River Watershed Summary of Discharges**

SCENARIO		CR 65	HWY 98	Weeks Bay
Existing Conditions		7,230	14,680	18,490
Existing Conditions – Add Pond above CR 65		7,000	14,510	18,440
Existing Conditions – Add Pond b/w HWY 98 & CR 65		7,230	14,160	17,920
Existing Conditions – Add Pond above CR 24		7,230	14,230	18,180



# QUESTIONS?

HYDRO  
ENGINEERING  
SOLUTIONS, LLC