

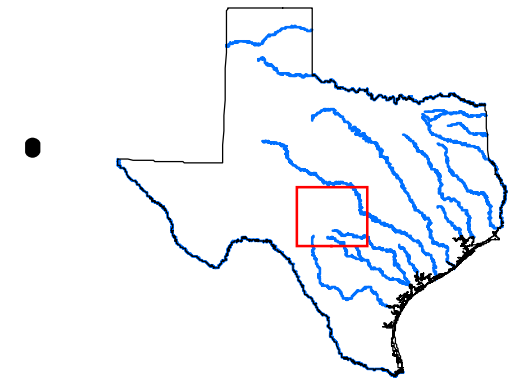
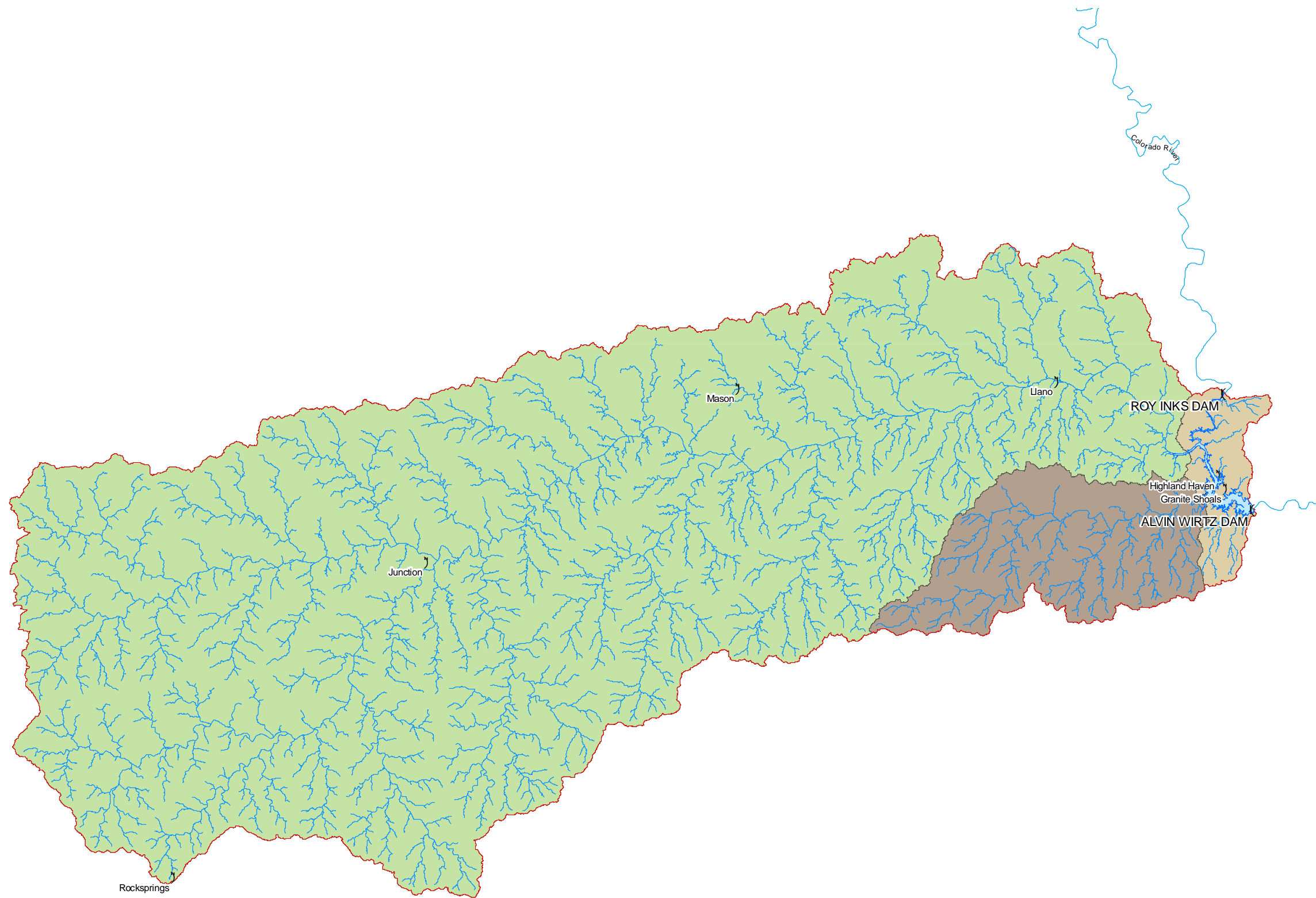
Legend

- " Major Cities
- Highways
- Counties
- Lake Marble Falls
- Lake Marble Falls Watershed
- Inks Lake Watershed
- Lake LBJ Watershed

Figure 3-1.
Phase 3 Watershed



November 2010



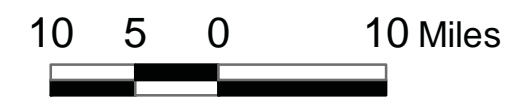
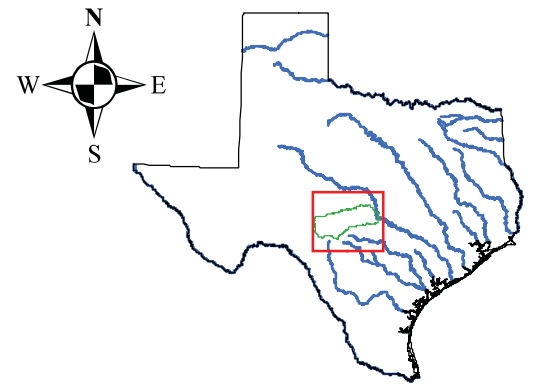
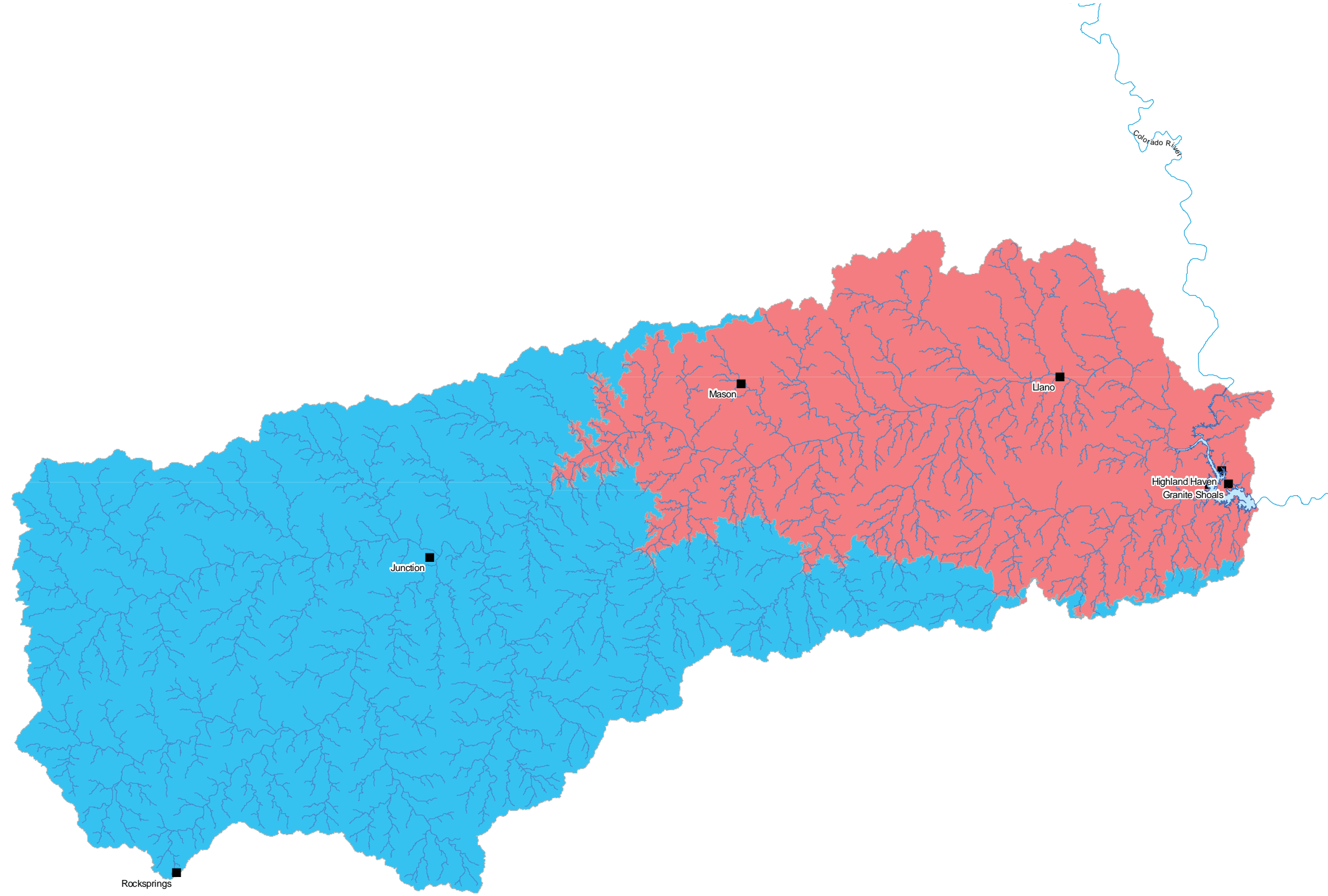
Legend

- Texas Cities
- ⌒ Dam
- Stream
- ▭ Lake LBJ Watershed
- ▭ Lake LBJ
- Lake LBJ Sub-watersheds**
- ▭ Direct Drainage
- ▭ Llano River
- ▭ Sandy Creek

Figure 3-2.
Lake LBJ Watershed and Stream Network



November 2010



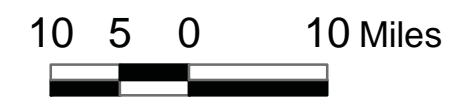
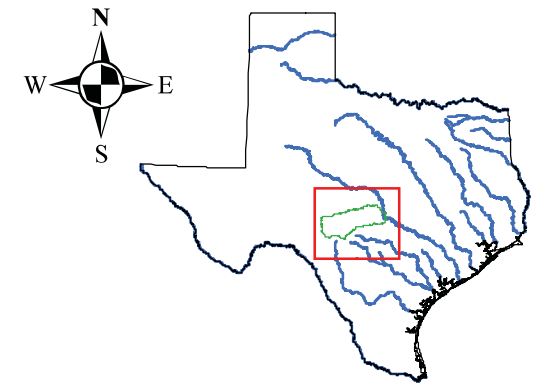
Legend

- Texas Cities
- Stream
- Lake LBJ
- Carbonate Karst
- Crystalline Rock

Figure 3-3.
 Lake LBJ Watershed
 Geologic Regions (Modified
 TWDB 2009)



November 2010



Legend

- Precipitation Gage
- Temperature Gage
- Lake LBJ

Precipitation (inches)

- 22-24
- 24-26
- 26-28
- 28-30
- 30-32

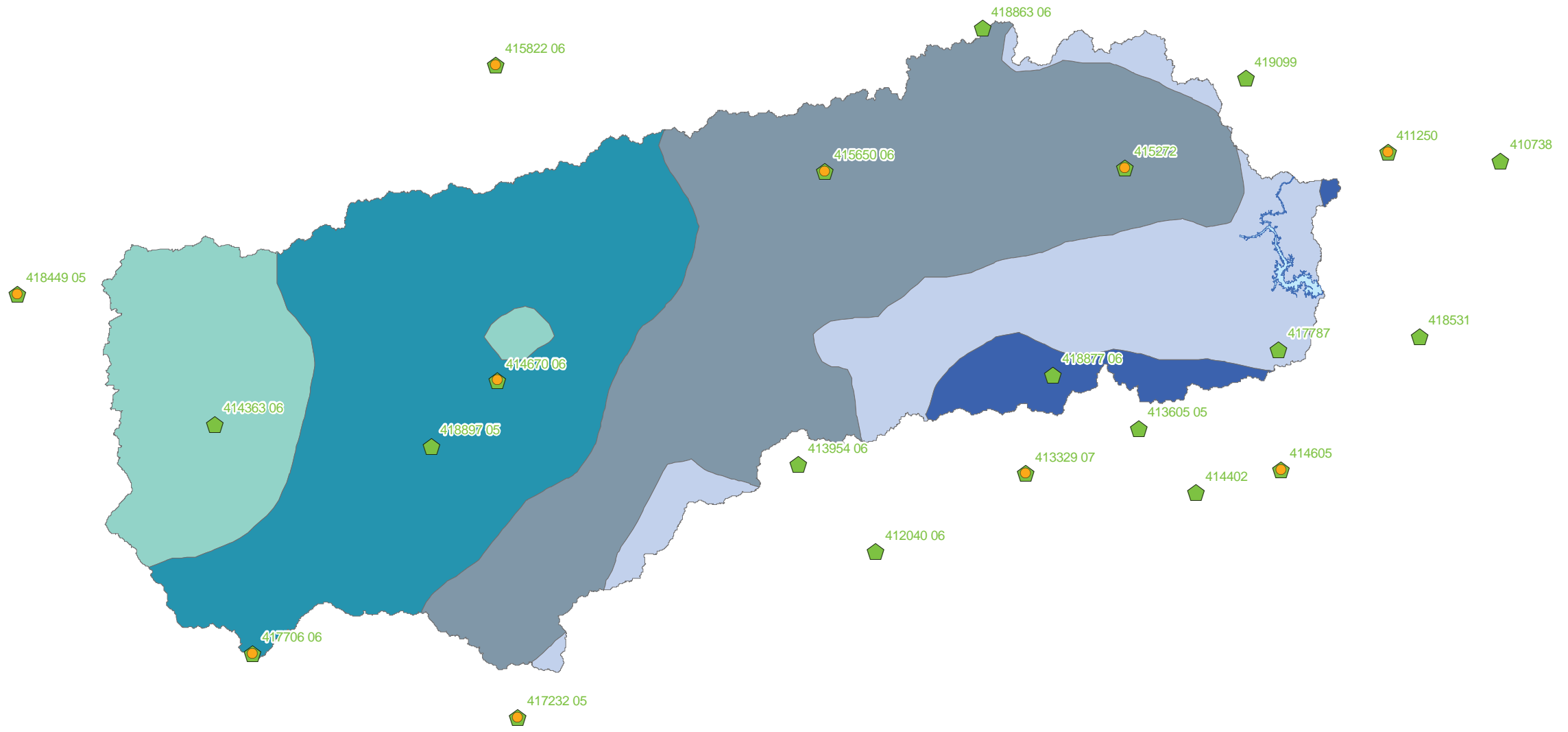
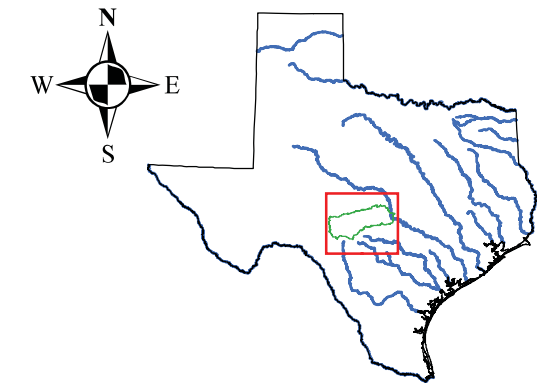
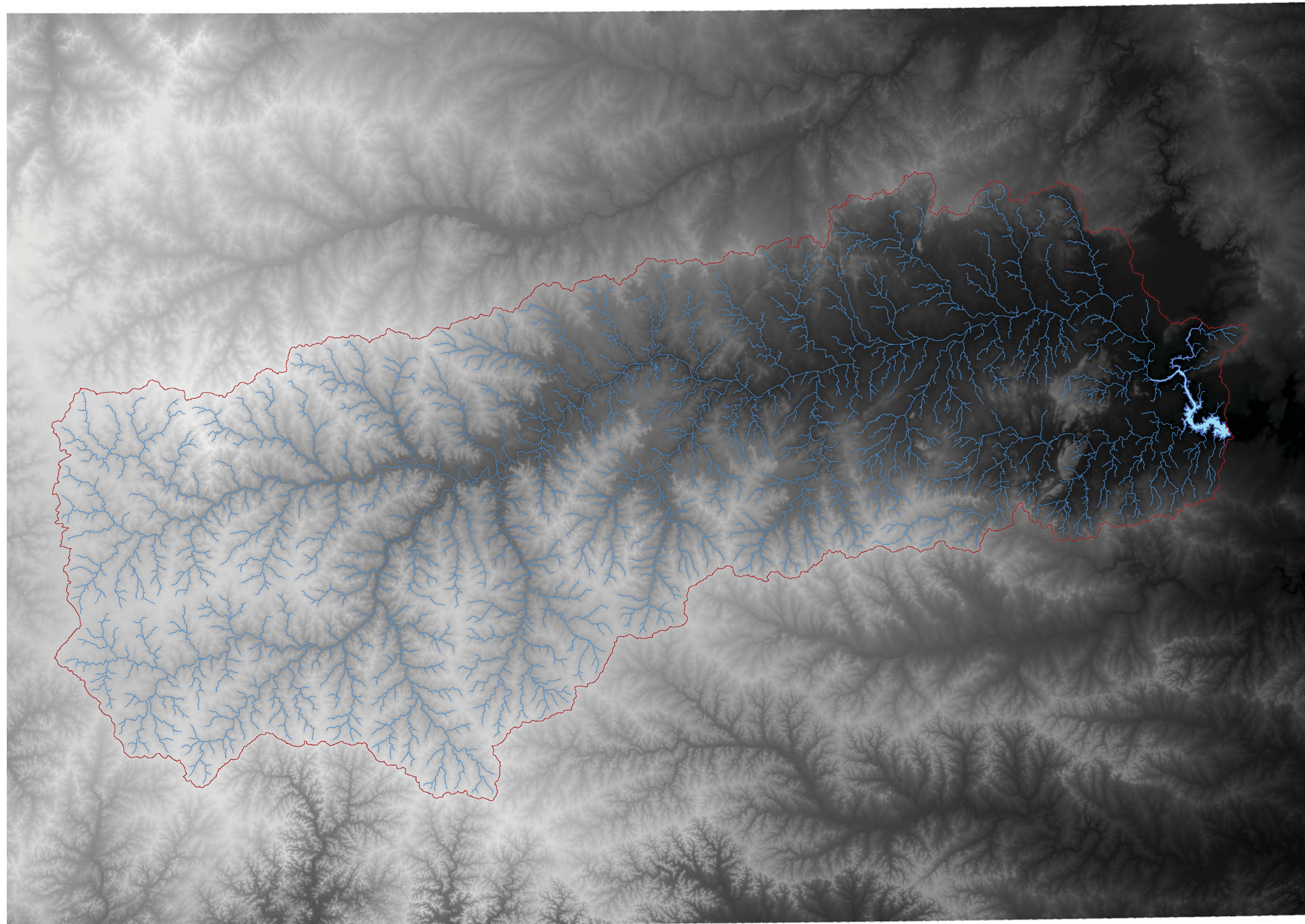


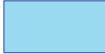


Figure 3-4.
 Lake LBJ Watershed
 Average Annual Precipitation
 and Meteorological Stations



November 2010



Legend

-  Lake LBJ
-  Stream
-  Lake LBJ Watershed

Elevation (m above msl)

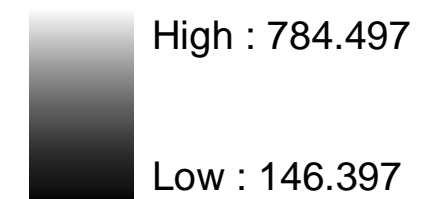
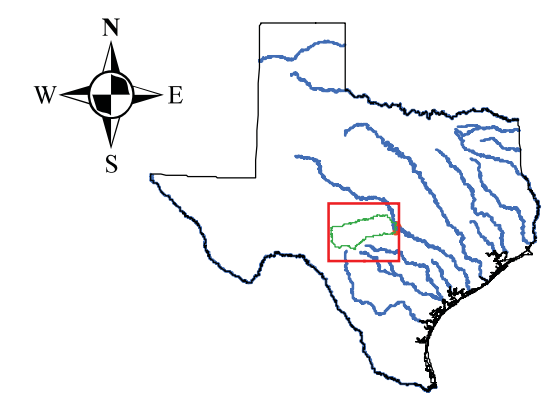
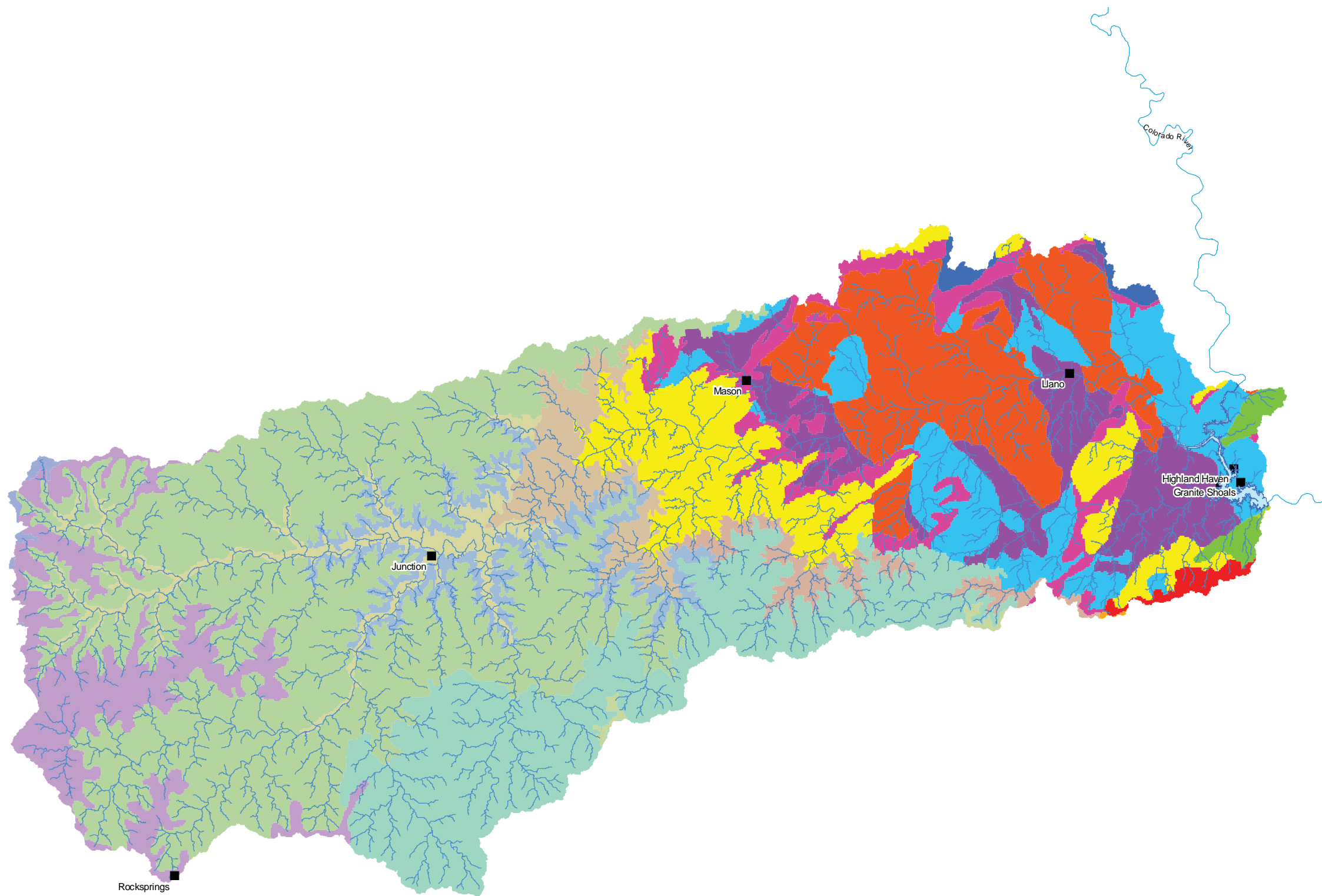


Figure 3-5.
Lake LBJ Watershed
with Digital Elevation Model



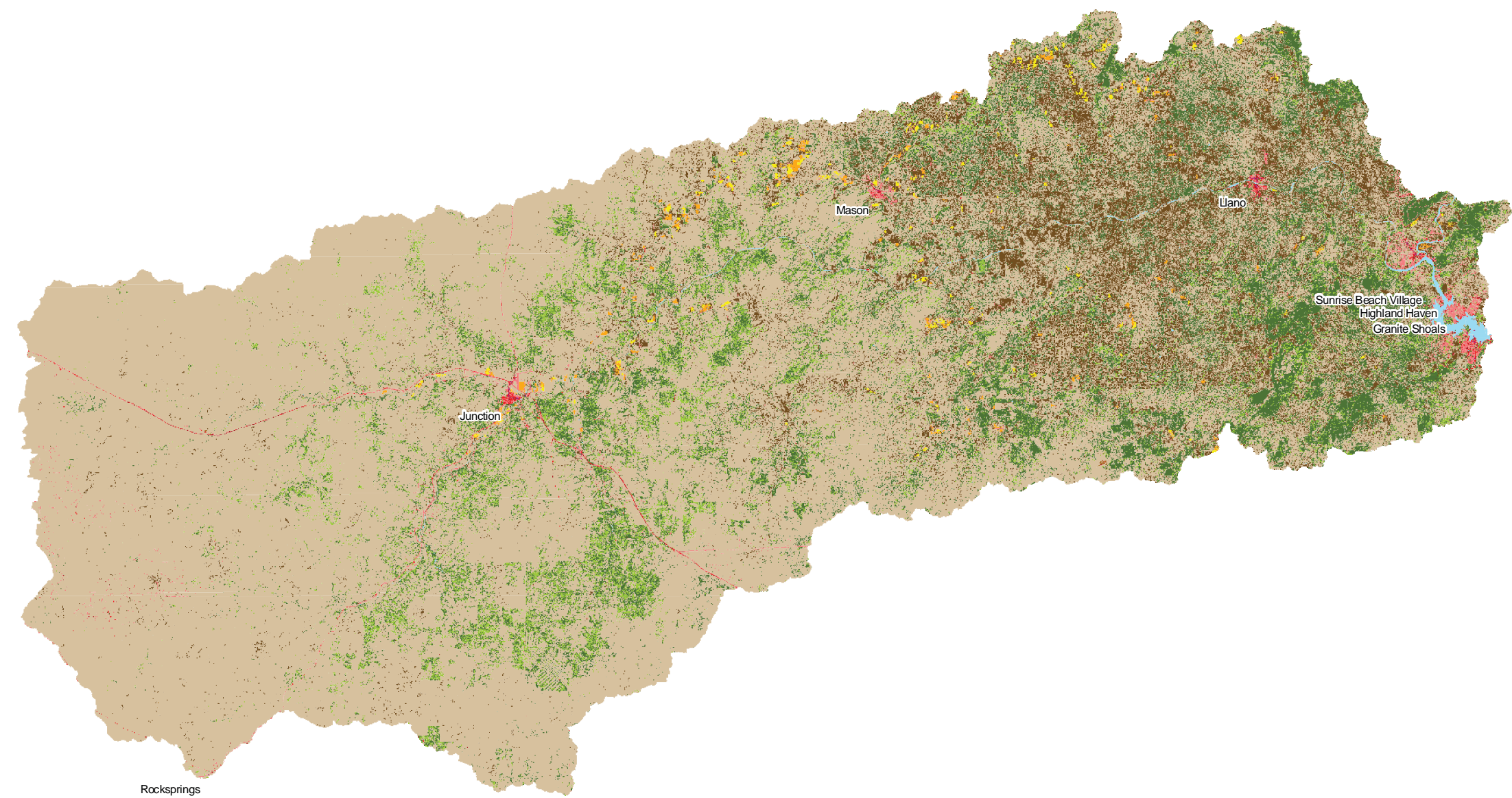
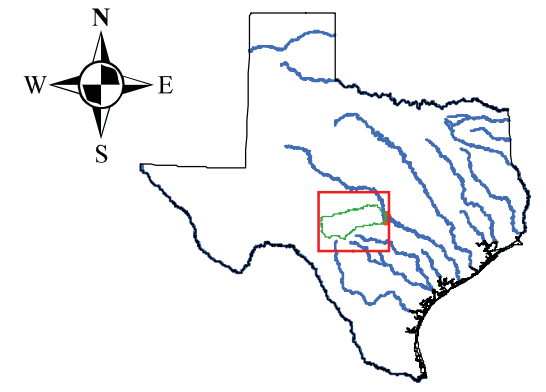
Legend

■ Texas Cities	■ TX488
— Stream	■ TX538
■ Lake LBJ	■ TX253
■ TX071	■ TX309
■ TX089	■ TX327
■ TX144	■ TX369
■ TX151	■ TX542
■ TX155	■ TX544
■ TX227	■ TX546
■ TX295	■ TX547
■ TX360	■ TX565
■ TX481	■ TX000

Figure 3-6.
Lake LBJ Watershed
STATSGO Classification



November 2010



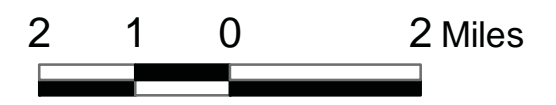
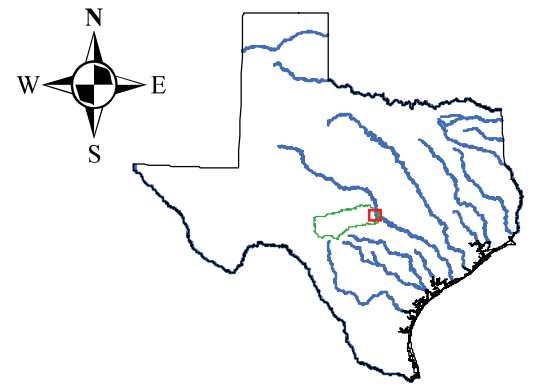
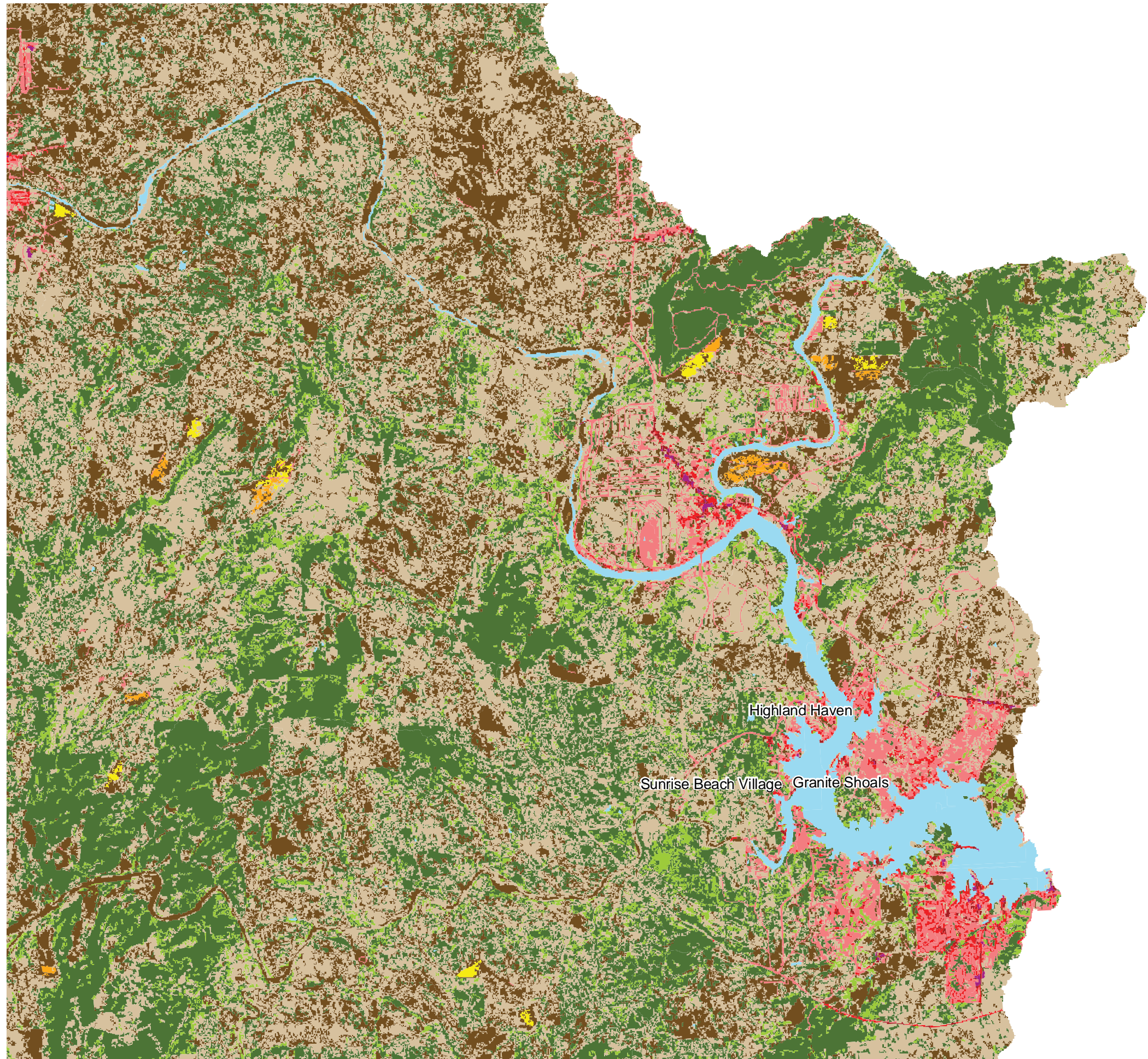
Legend

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Forested Wetlands
- Agricultural Land-Row Crop
- Hay
- Range - Brush
- Range - Grasses
- Range - Southwestern Arid
- Residential-Low Density
- Residential-Medium Density
- Residential-High Density
- Industrial
- Water

Figure 3-7.
Lake LBJ Watershed
Land Cover



November 2010



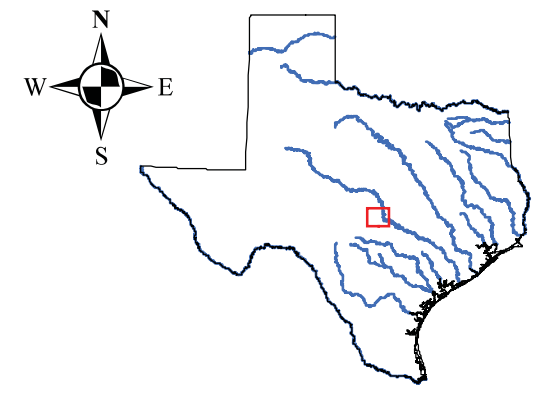
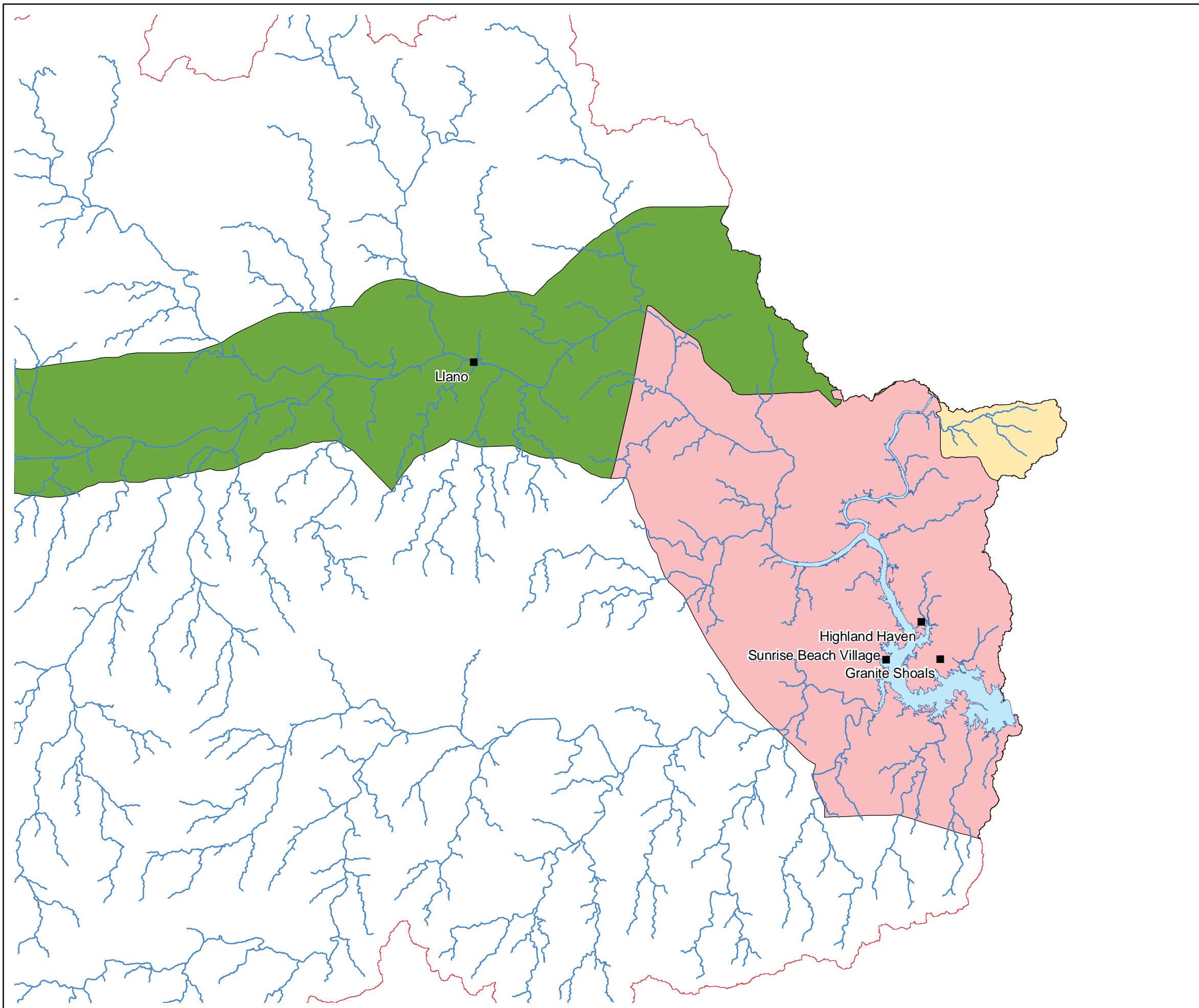
Legend

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Forested Wetlands
- Agricultural Land-Row Crop
- Hay
- Range - Brush
- Range - Grasses
- Range - Southwestern Arid
- Residential-Low Density
- Residential-Medium Density
- Residential-High Density
- Industrial
- Water

Figure 3-8.
Development near Lake LBJ



November 2010

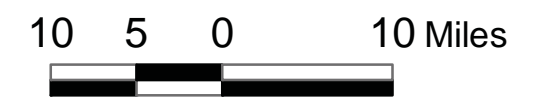
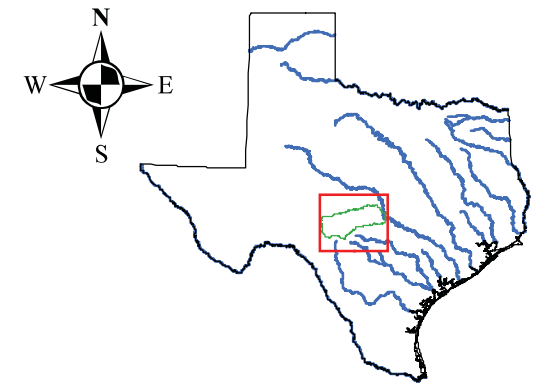


Legend

- Texas Cities
- Stream
- Lake LBJ Watershed
- Lake LBJ
- Highland Lakes Watershed Ordinance**
- Region A
- Region B
- Region C

Figure 3-9.
Lake LBJ Watershed within
the HLWO





Legend

- Texas Cities
- ▲ Permitted Discharger
- Stream
- Lake LBJ Watershed
- Lake LBJ

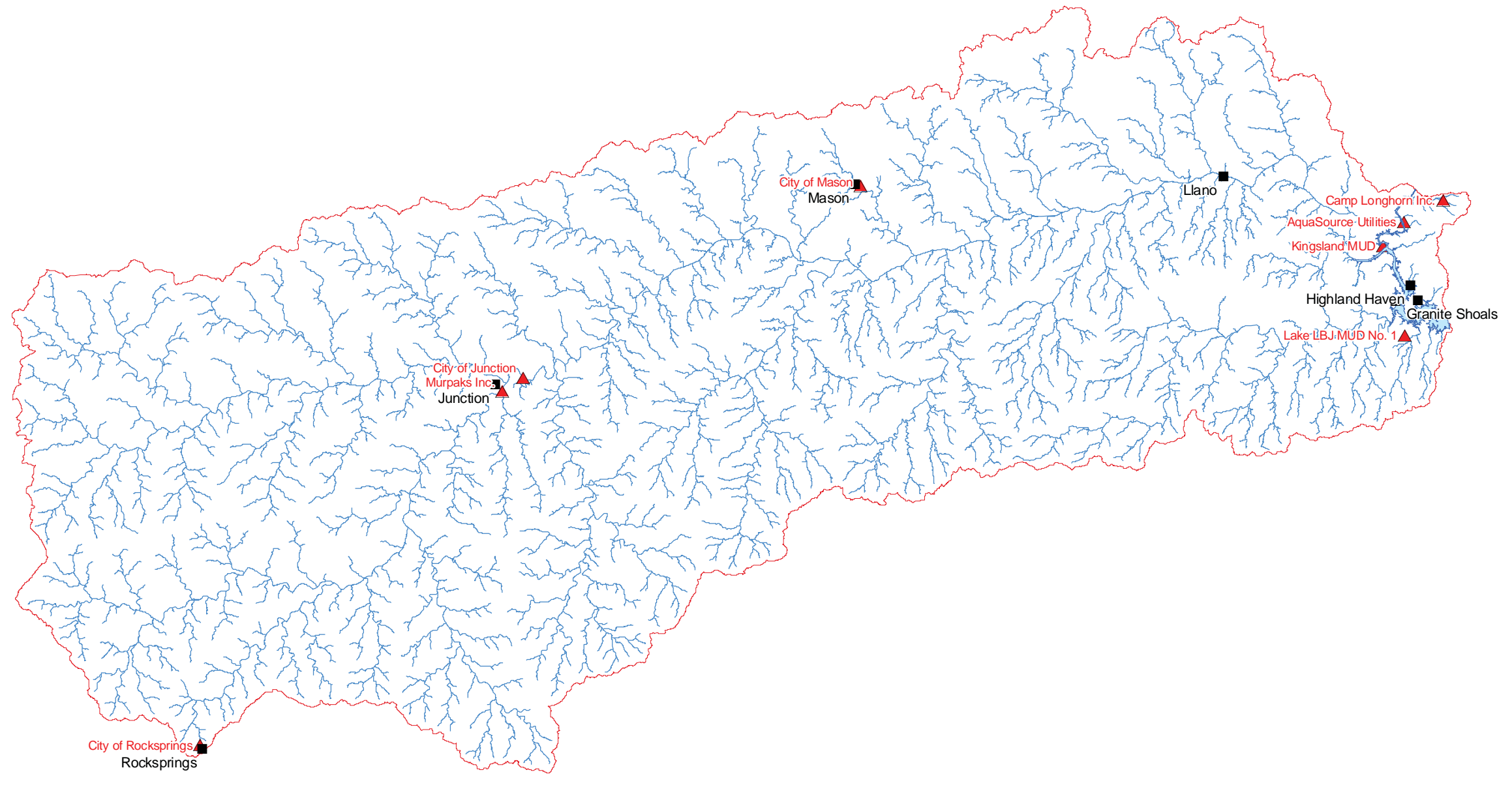
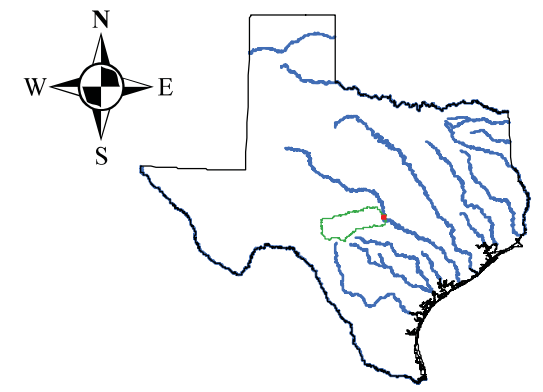
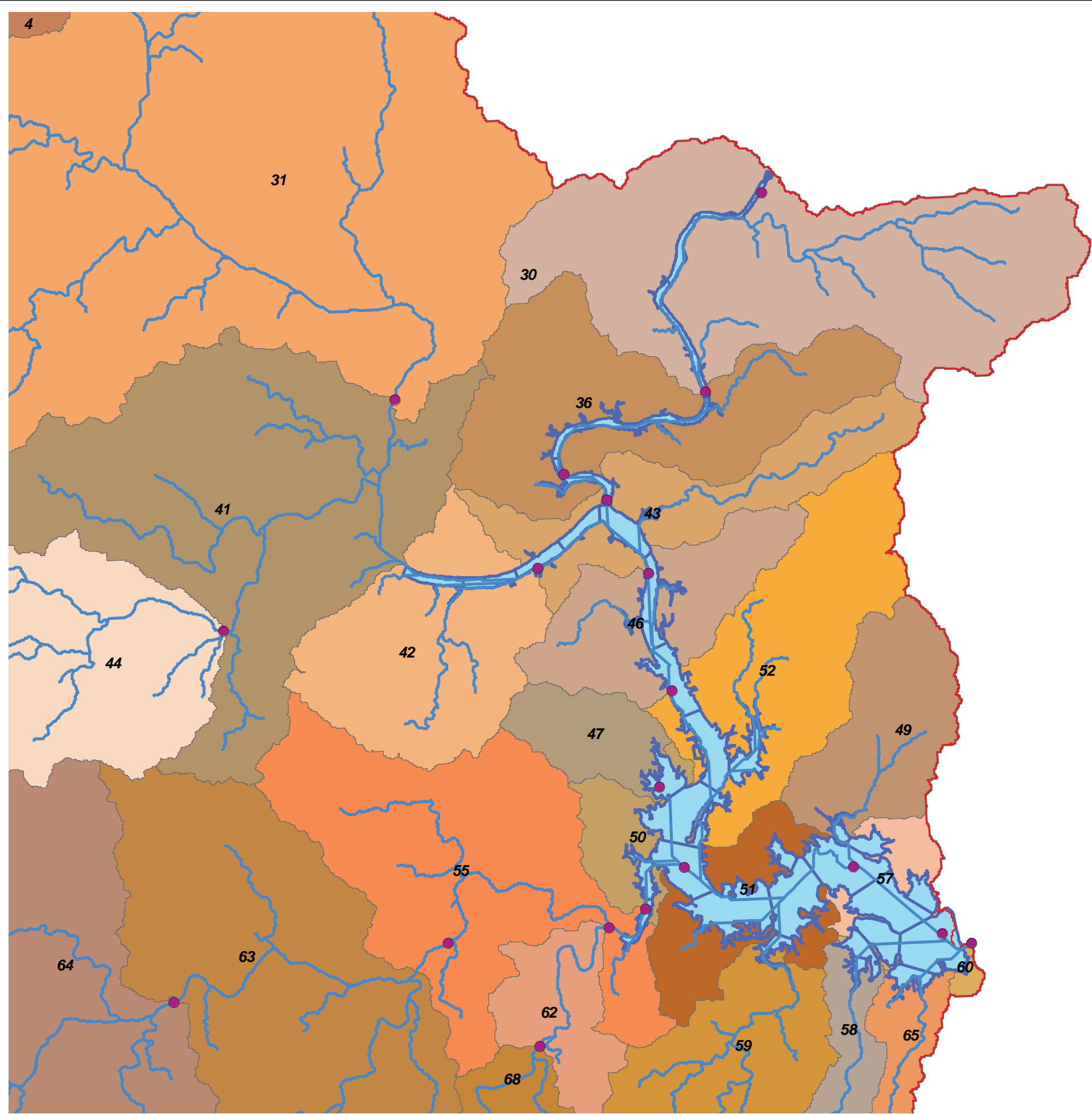


Figure 3-10.
Lake LBJ Watershed
Permitted Dischargers



November 2010



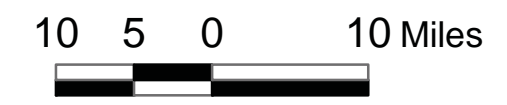
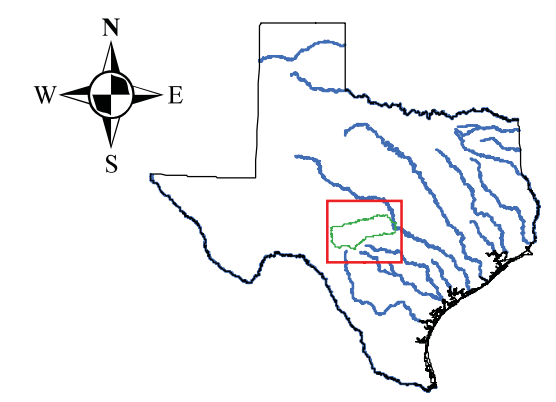
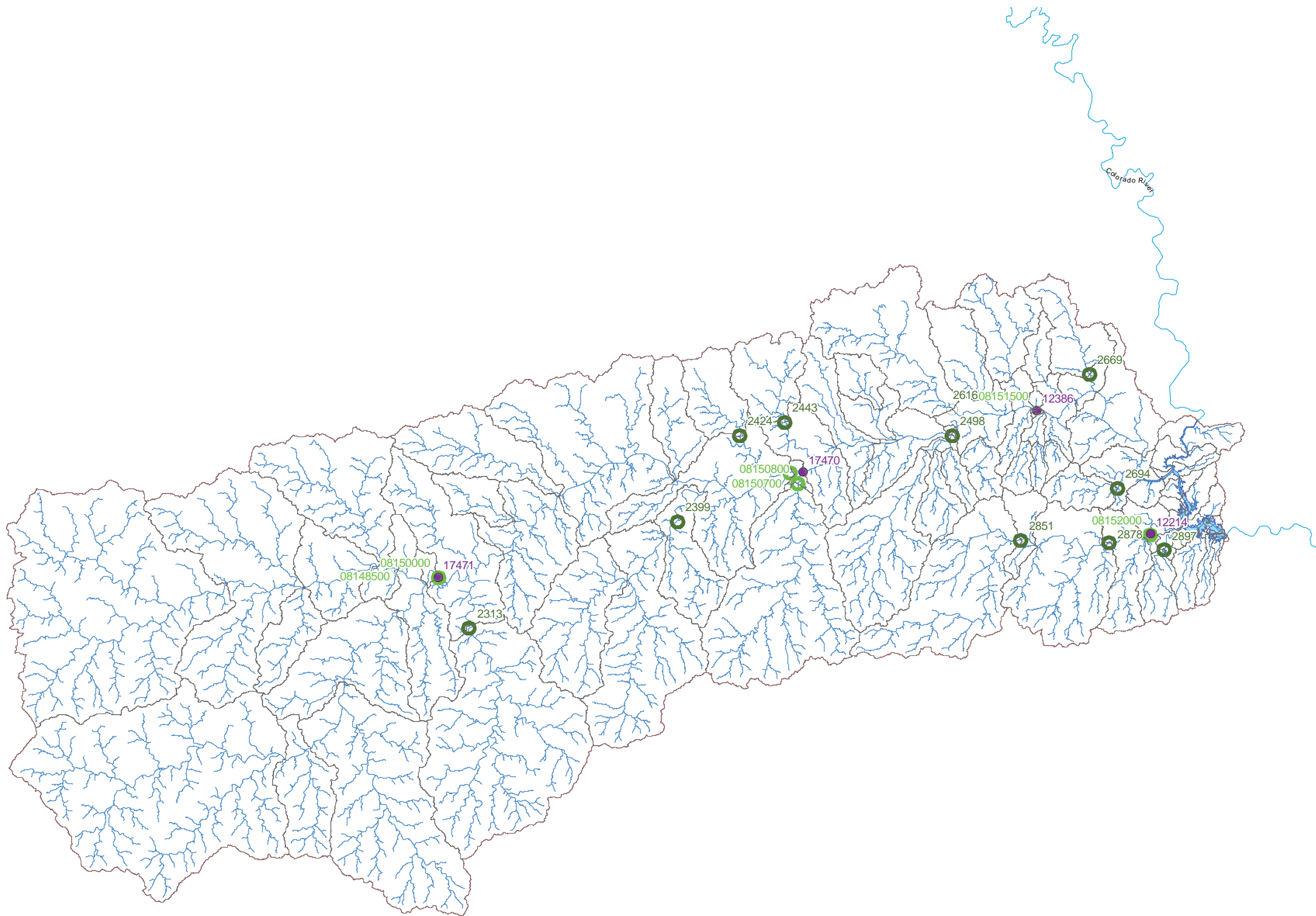
Legend

- Pour Points
- Stream
- Lake LBJ Watershed
- Lake LBJ Model Segment
- SWAT Model Subbasin

Figure 3-11.
 Lake LBJ Lake Model
 Segmentation and Watershed
 Model Pour Points



November 2010



Legend

- USGS Calibration Station
- Hydromet Calibration Station
- Water Quality Calibration Station
- Stream
- Lake LBJ Watershed
- Lake LBJ Model Segment
- Lake LBJ Delineation

Figure 3-12.
 Lake LBJ Sub-watershed
 Delineation with Calibration
 Stations



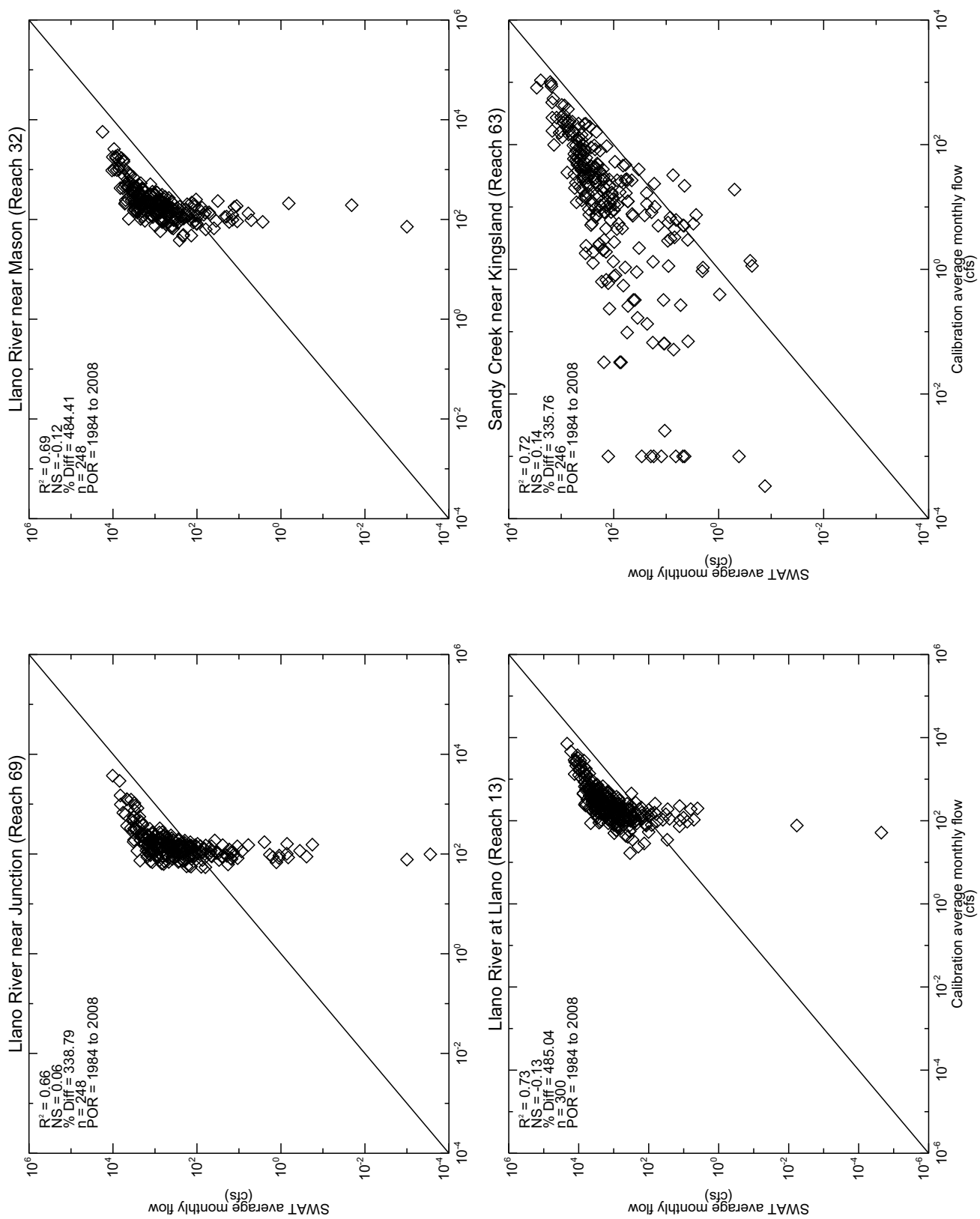


Figure 3-13. Lake LBJ SWAT model monthly average flow calibration by reach using default model parameters

Model run: default
 Calibration values are measured USGS
 Calibration values of 0 are plotted as 0.001.
 JRB - D:\Jobs\PARcrrm\Analysis\jrb_lbj_postprocess\parcrrm_xy_20090709.pro
 Fri Jan 29 13:32:03 2010

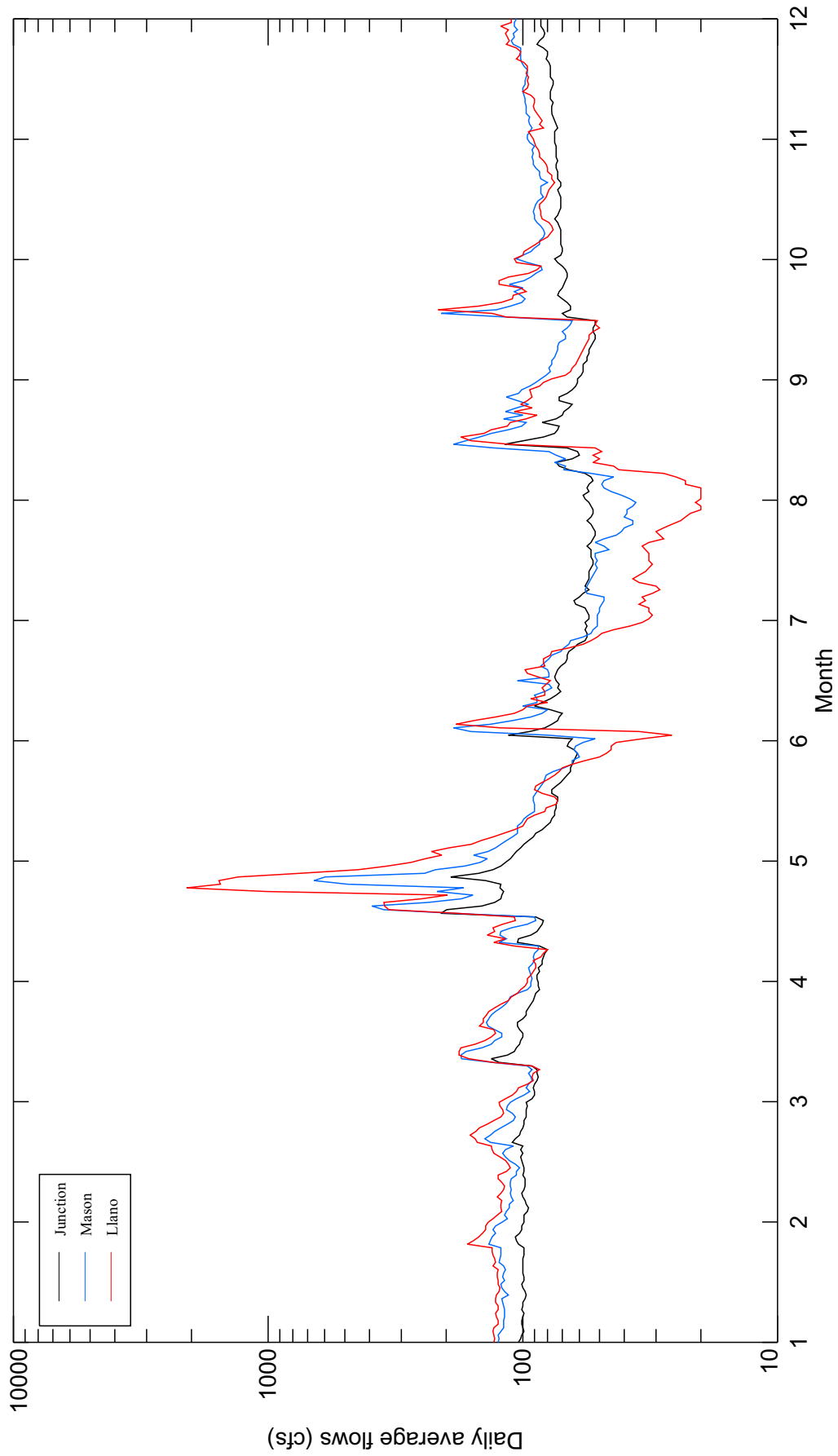


Figure 3-14. Llano River average daily flows at Junction, Mason, and Llano in 2006

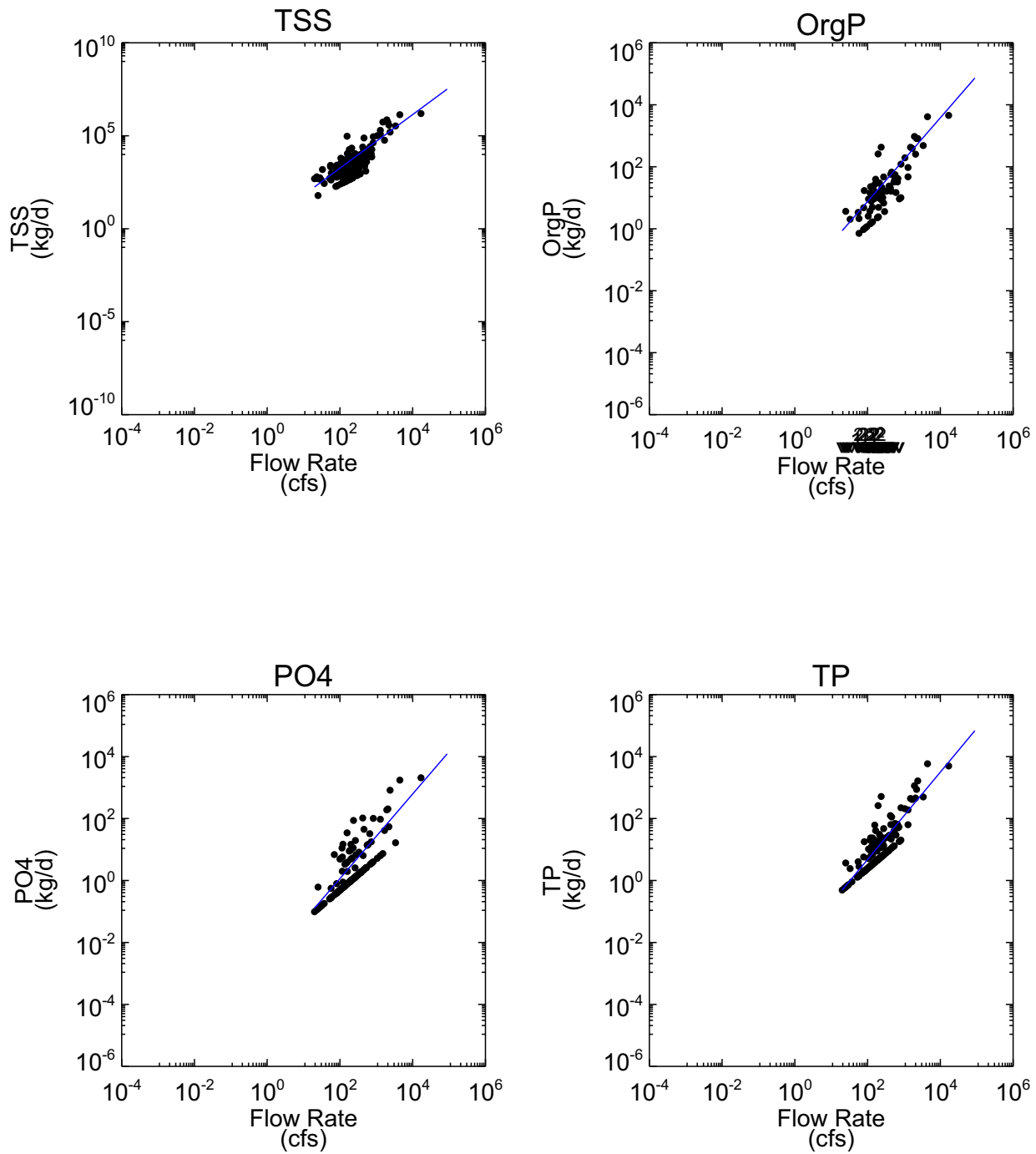


Figure 3-15a. Rating curves predicted by LOADEST for Llano River near Llano

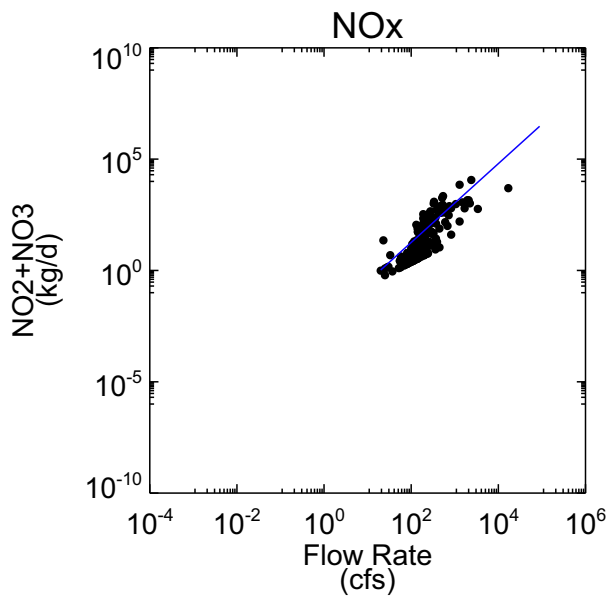
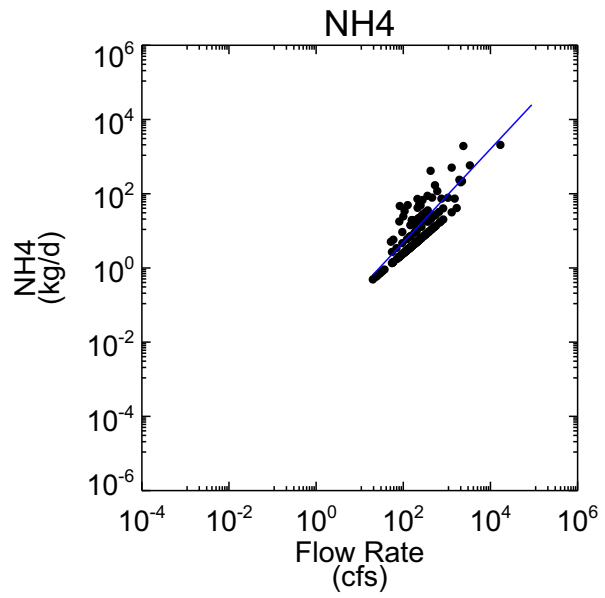
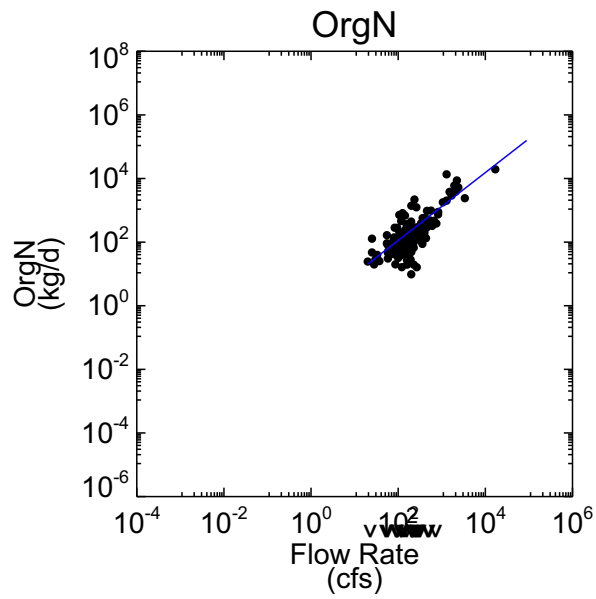


Figure 3-15a. Rating curves predicted by LOADEST for Llano River near Llano

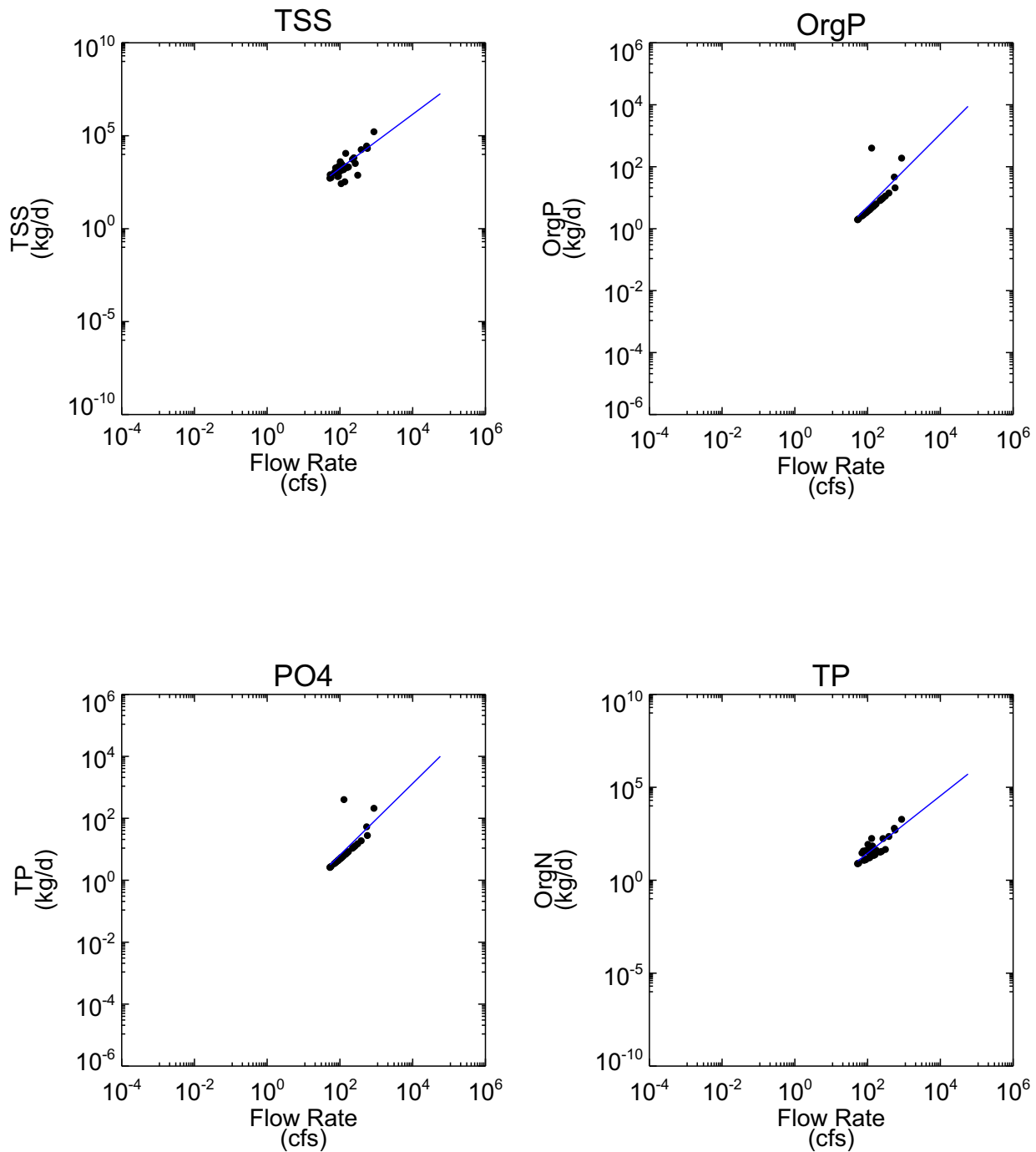


Figure 3-15b. Rating curves predicted by LOADEST for Llano River near Junction

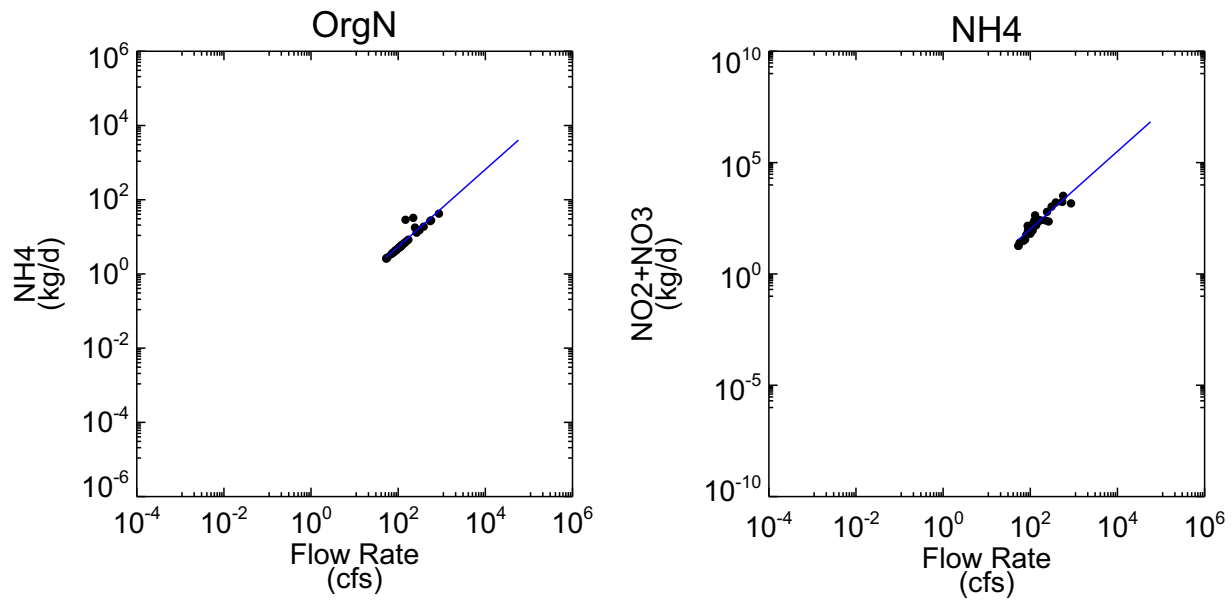


Figure 3-15b. Rating curves predicted by LOADEST for Llano River near Junction

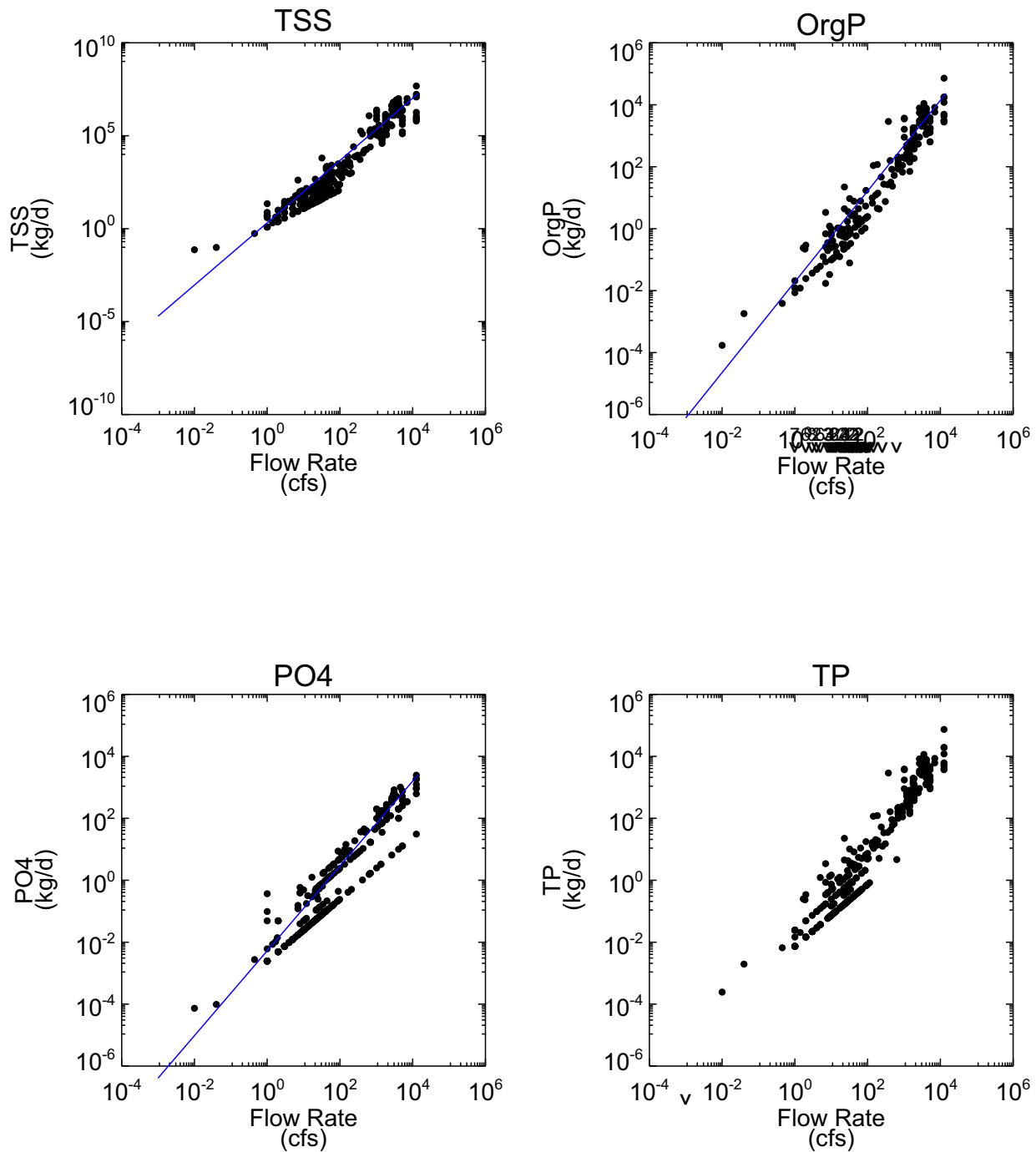


Figure 3-15c. Rating curves predicted by LOADEST for Sandy Creek near Kingsland

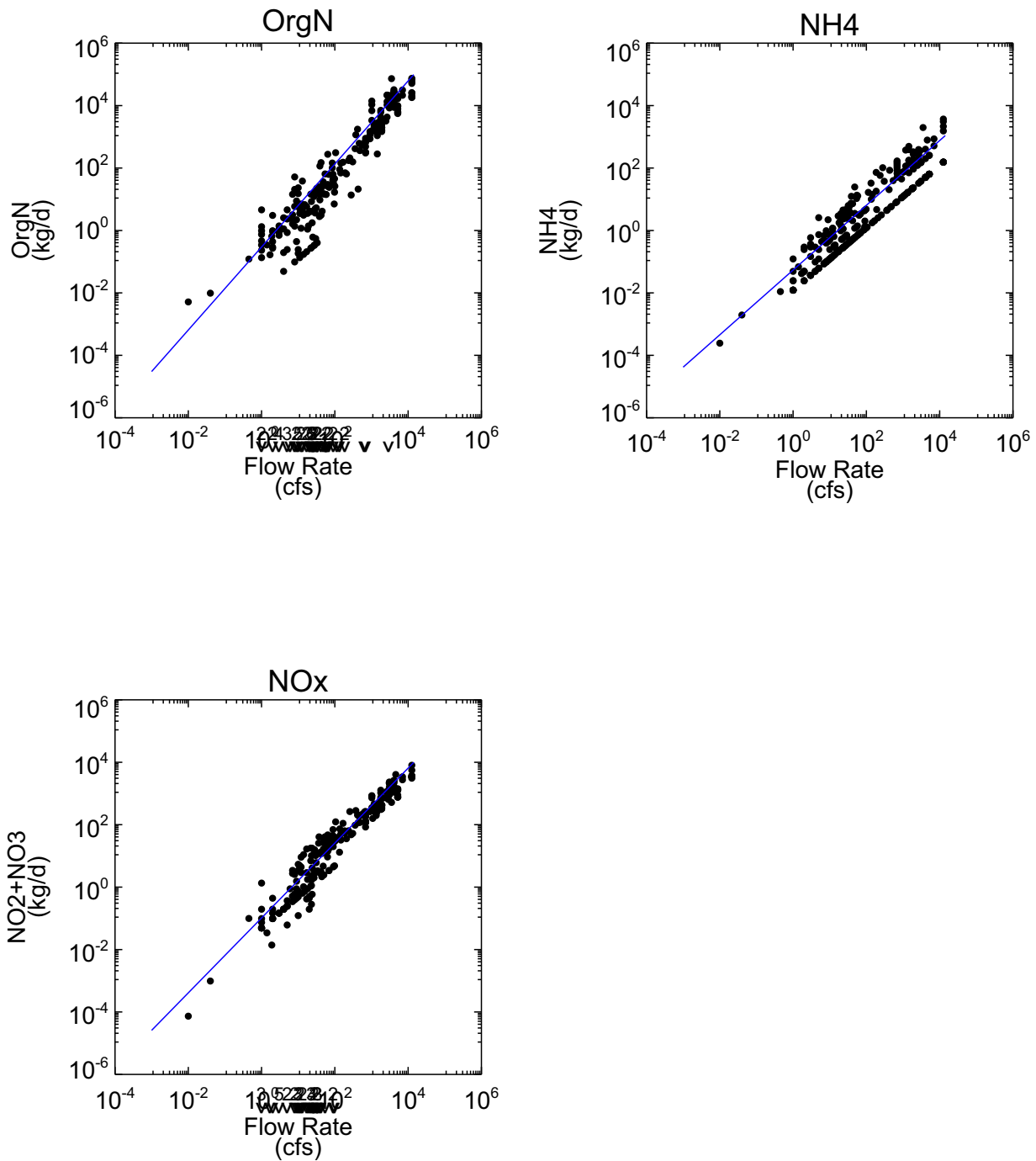


Figure 3-15c. Rating curves predicted by LOADEST for Sandy Creek near Kingsland

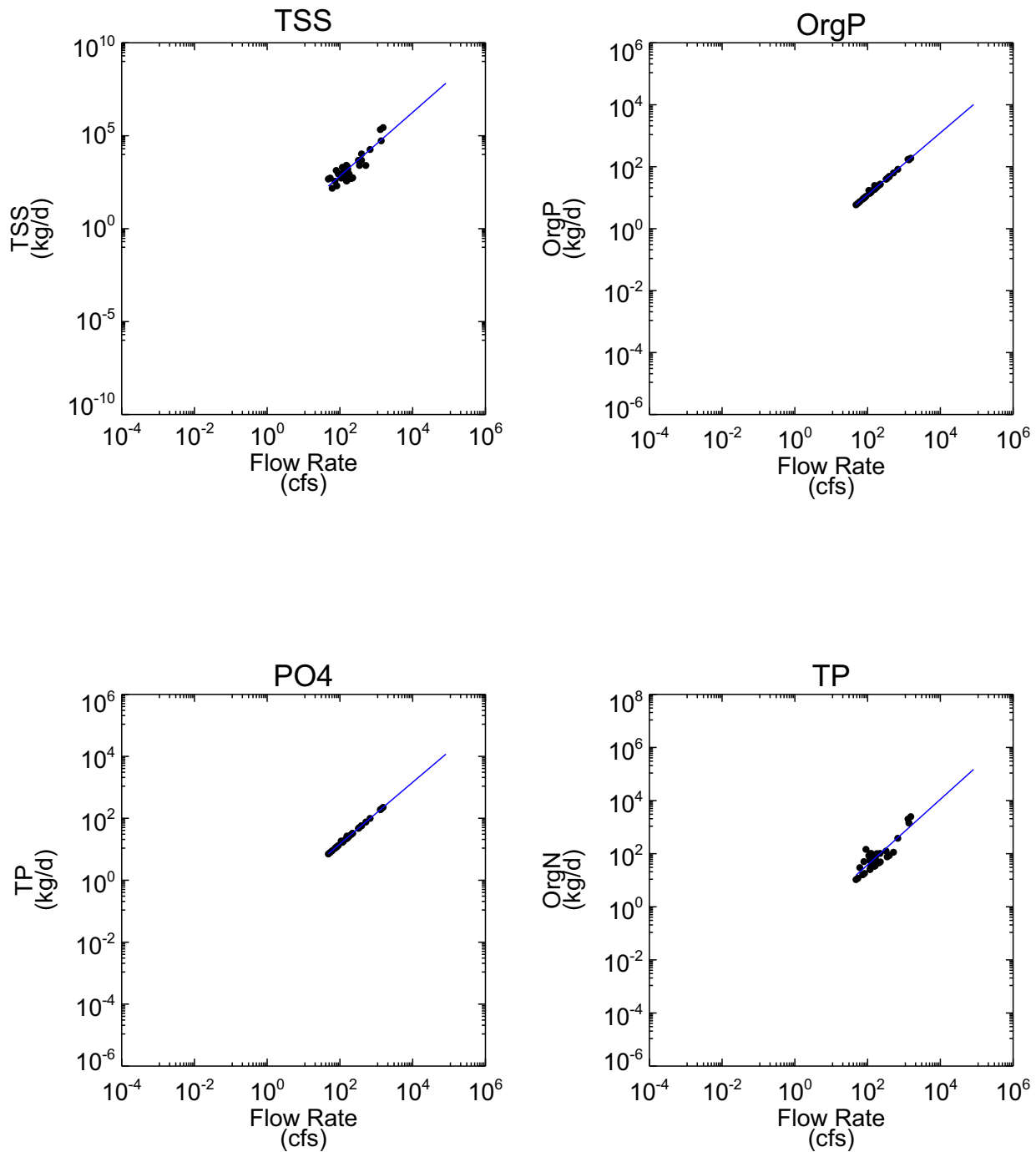


Figure 3-15d. Rating curves predicted by LOADEST for Llano River near Mason

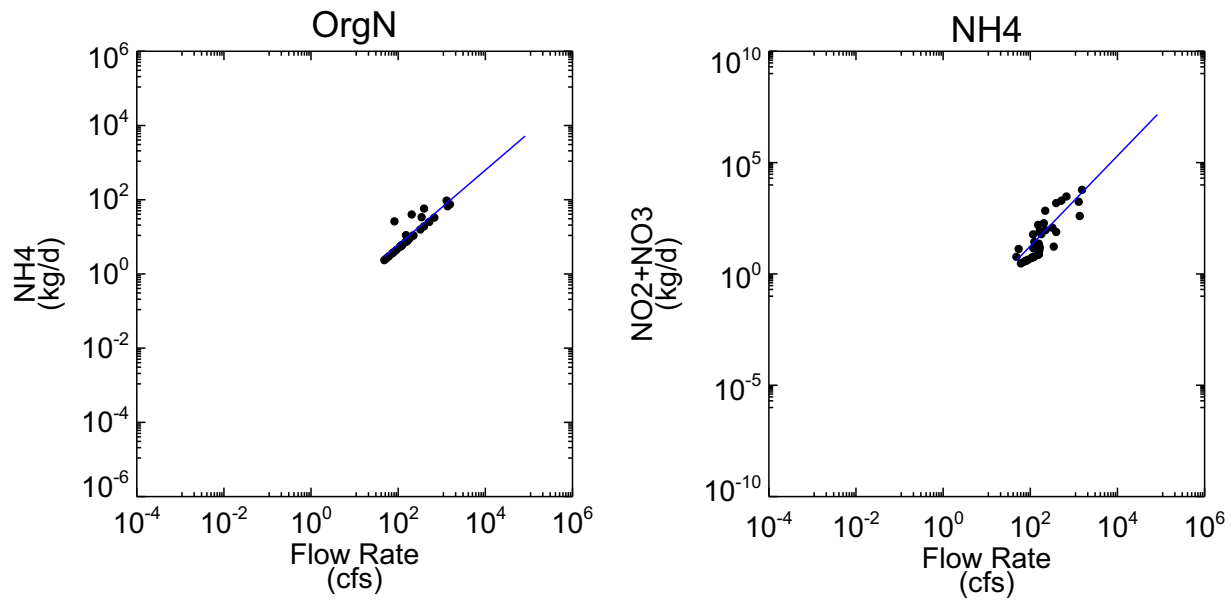


Figure 3-15d. Rating curves predicted by LOADEST for Llano River near Mason

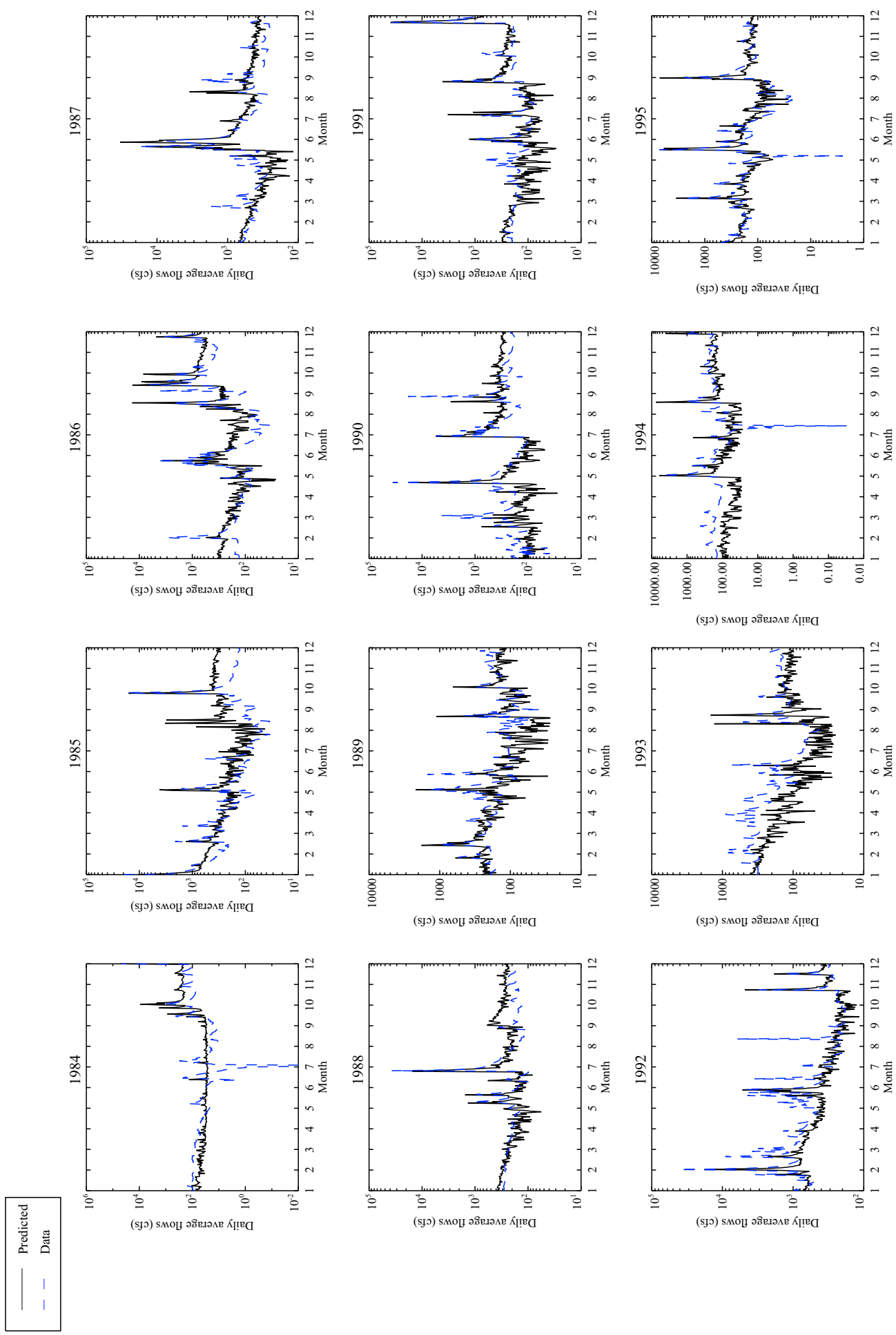


Figure 3-16a. Lake LBJ SWAT model average daily flows calibration for Llano River at Llano (Reach 13)

Model run: final.
 $R^2 = 0.55$; $NS = 0.47$; $Vol \%Diff = 1.77$

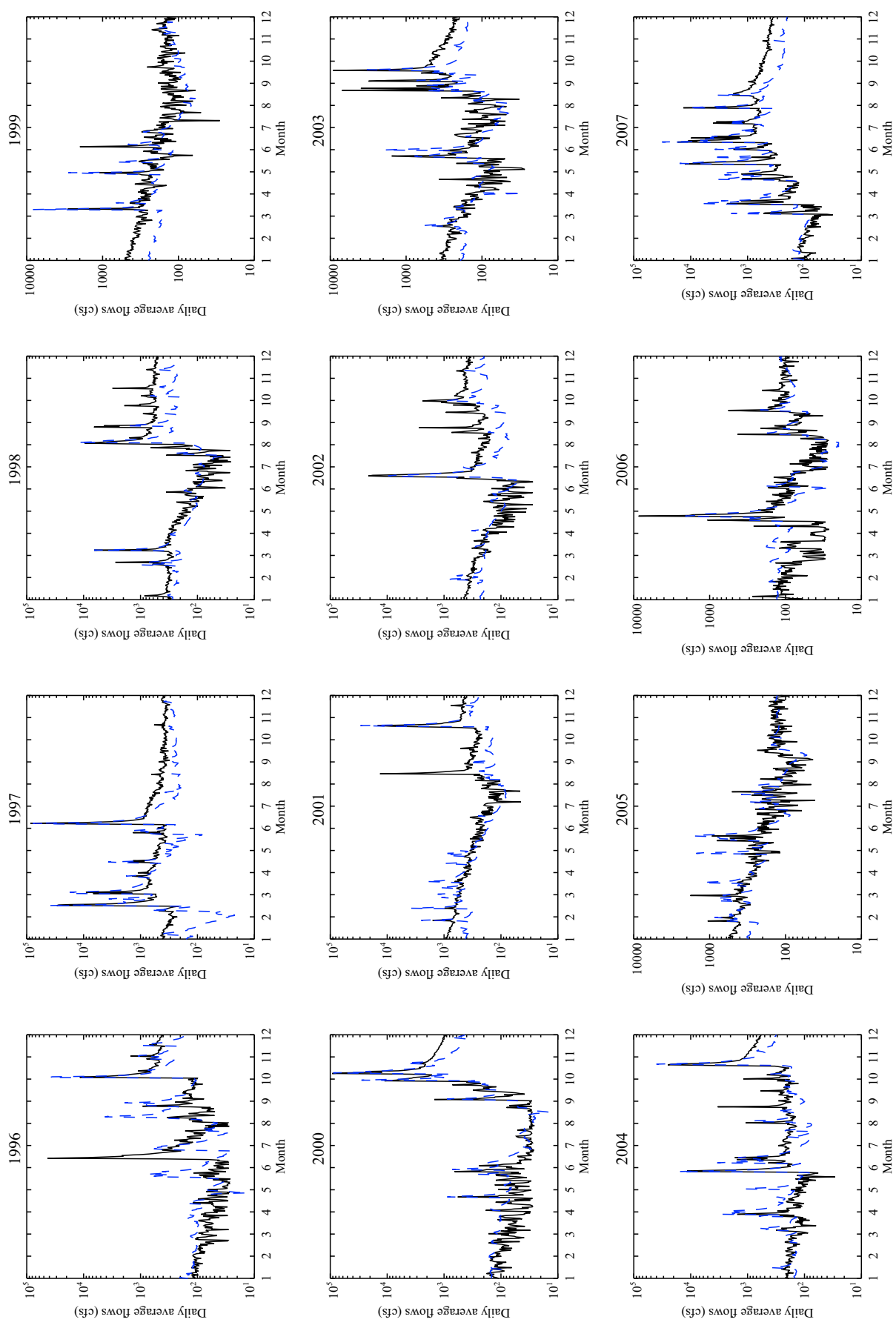
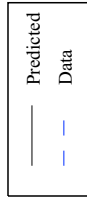


Figure 3-16a. Lake LBJ SWAT model average daily flows calibration for Llano River at Llano (Reach 13)

Model run: final.
 $R^2 = 0.55$; $NS = 0.47$; $Vol \%Diff = 1.77$

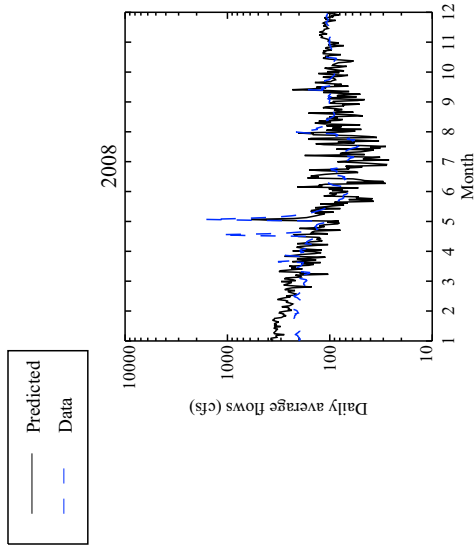


Figure 3-16a. Lake LBJ SWAT model average daily flows calibration for Llano River at Llano (Reach 13)

Model run: final.
 $R^2 = 0.55$; $NS = 0.47$; $Vol \%Diff = 1.77$

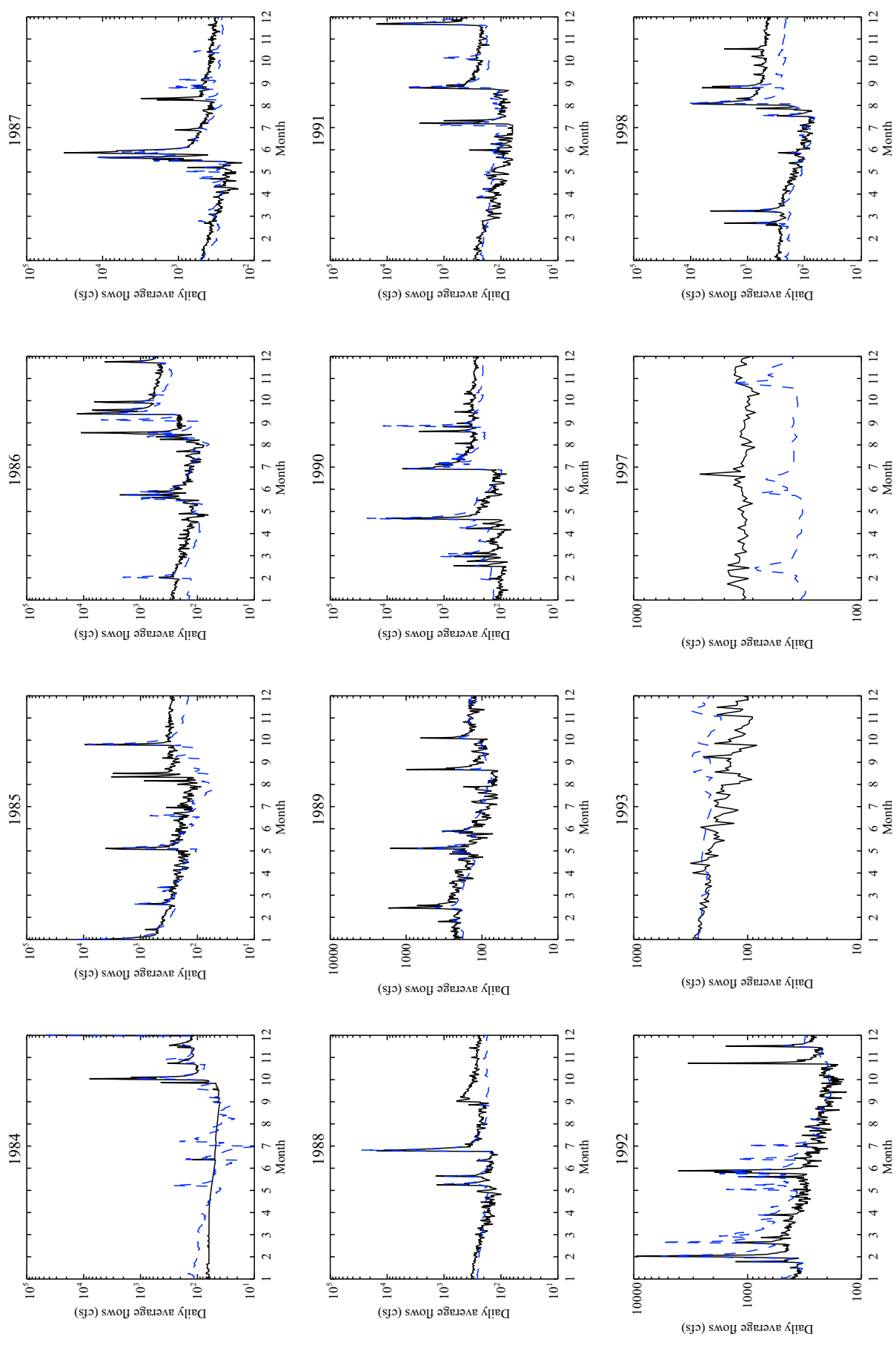
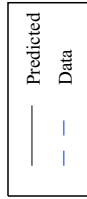


Figure 3-16b. Lake LBJ SWAT model average daily flows calibration for Llano River near Mason (Reach 32)

Model run: final.

R2 = 0.50: NS = 0.42: Vol %Diff = 15.00

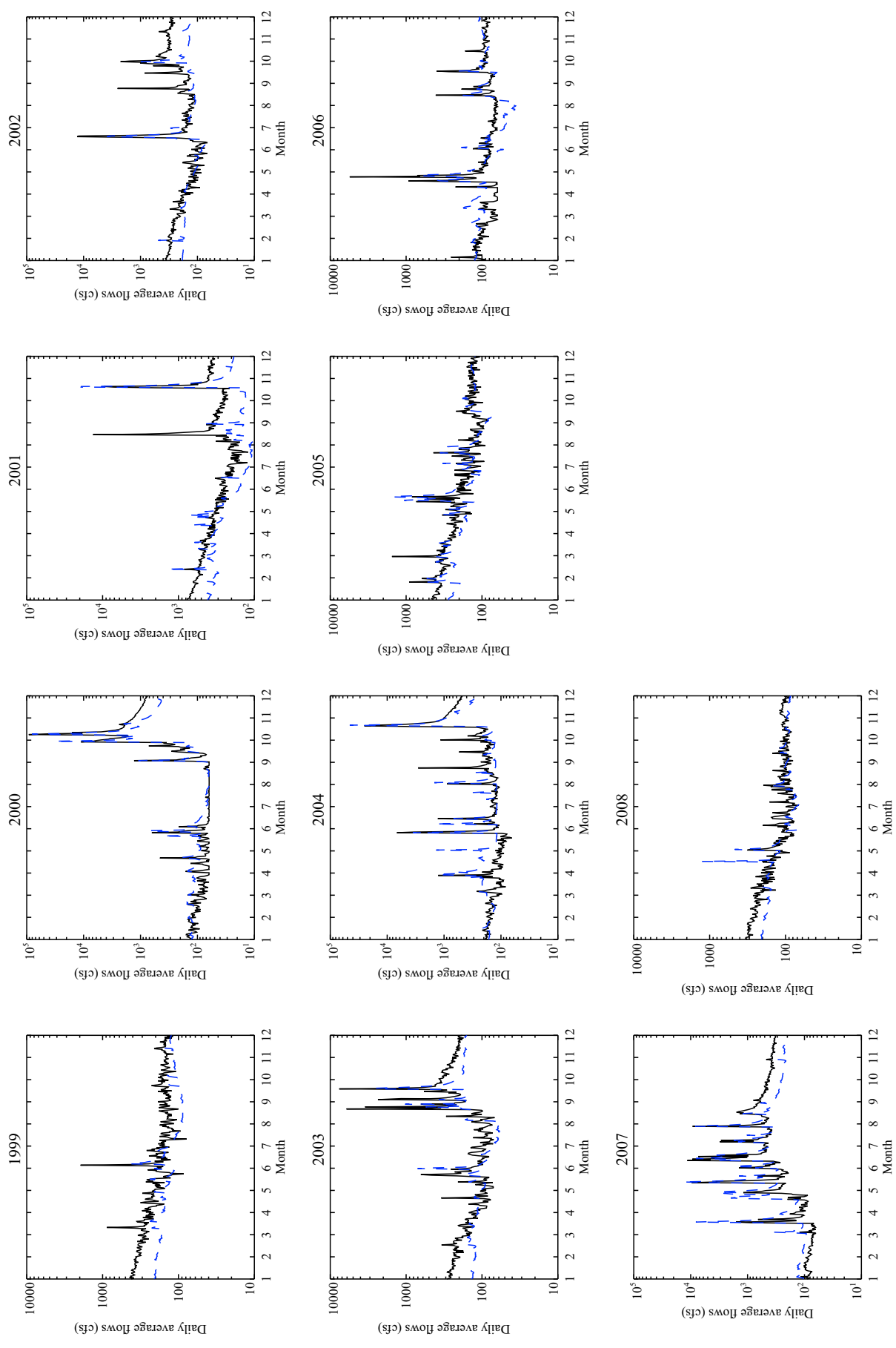
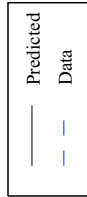


Figure 3-16b. Lake LBJ SWAT model average daily flows calibration for Llano River near Mason (Reach 32)

Model run: final.
 $R^2 = 0.50$; NS = 0.42; Vol %Diff = 15.00

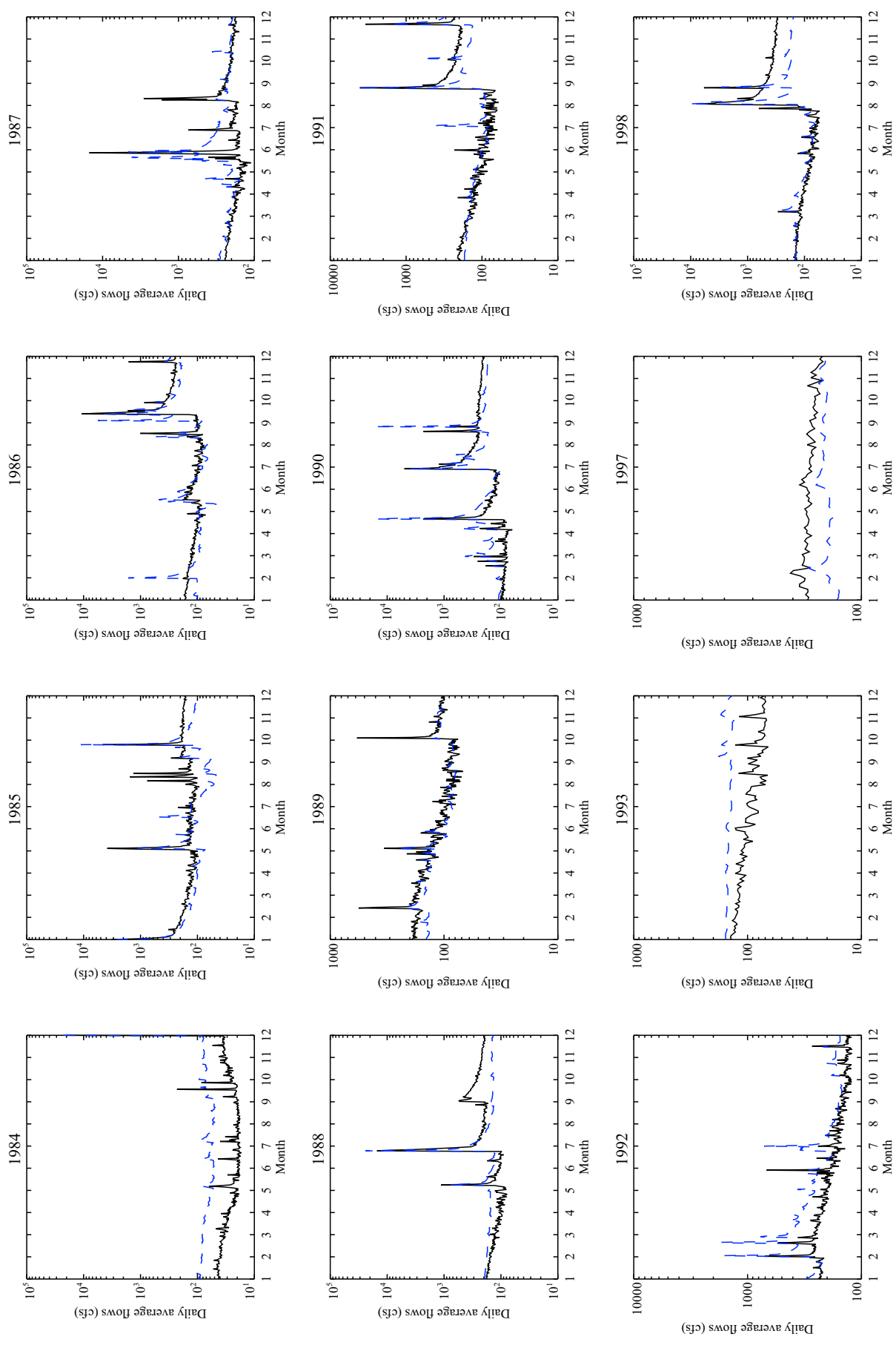
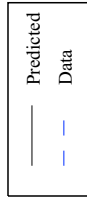


Figure 3-16c. Lake LBJ SWAT model average daily flows calibration for Llano River near Junction (Reach 69)

Model run: final.
 $R^2 = 0.64$; $NS = 0.52$; $Vol \%Diff = -4.06$

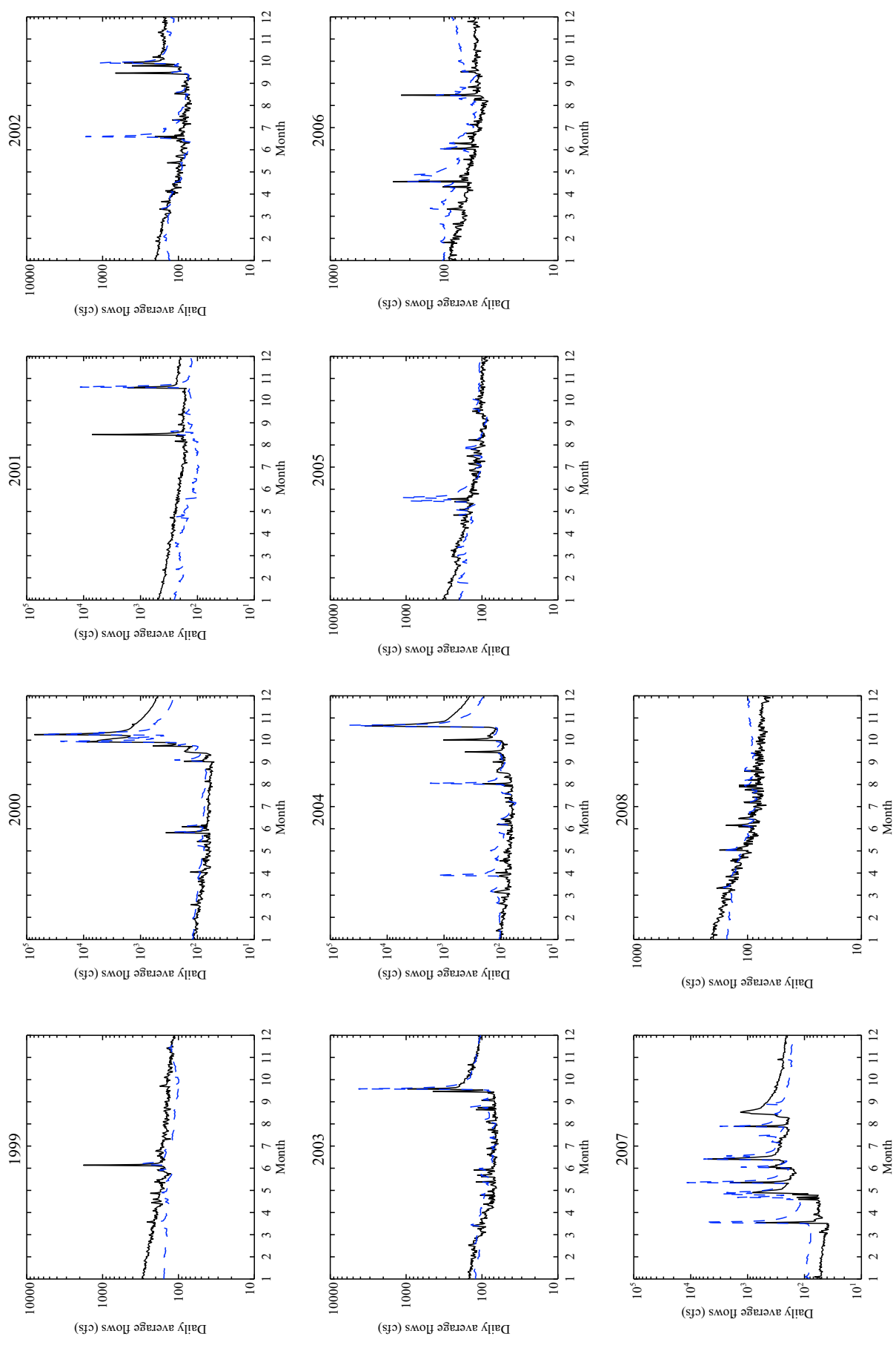
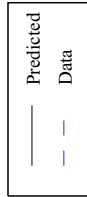


Figure 3-16c. Lake LBJ SWAT model average daily flows calibration for Llano River near Junction (Reach 69)

Model run: final.
 $R^2 = 0.64$; $NS = 0.52$; $Vol \%Diff = -4.06$

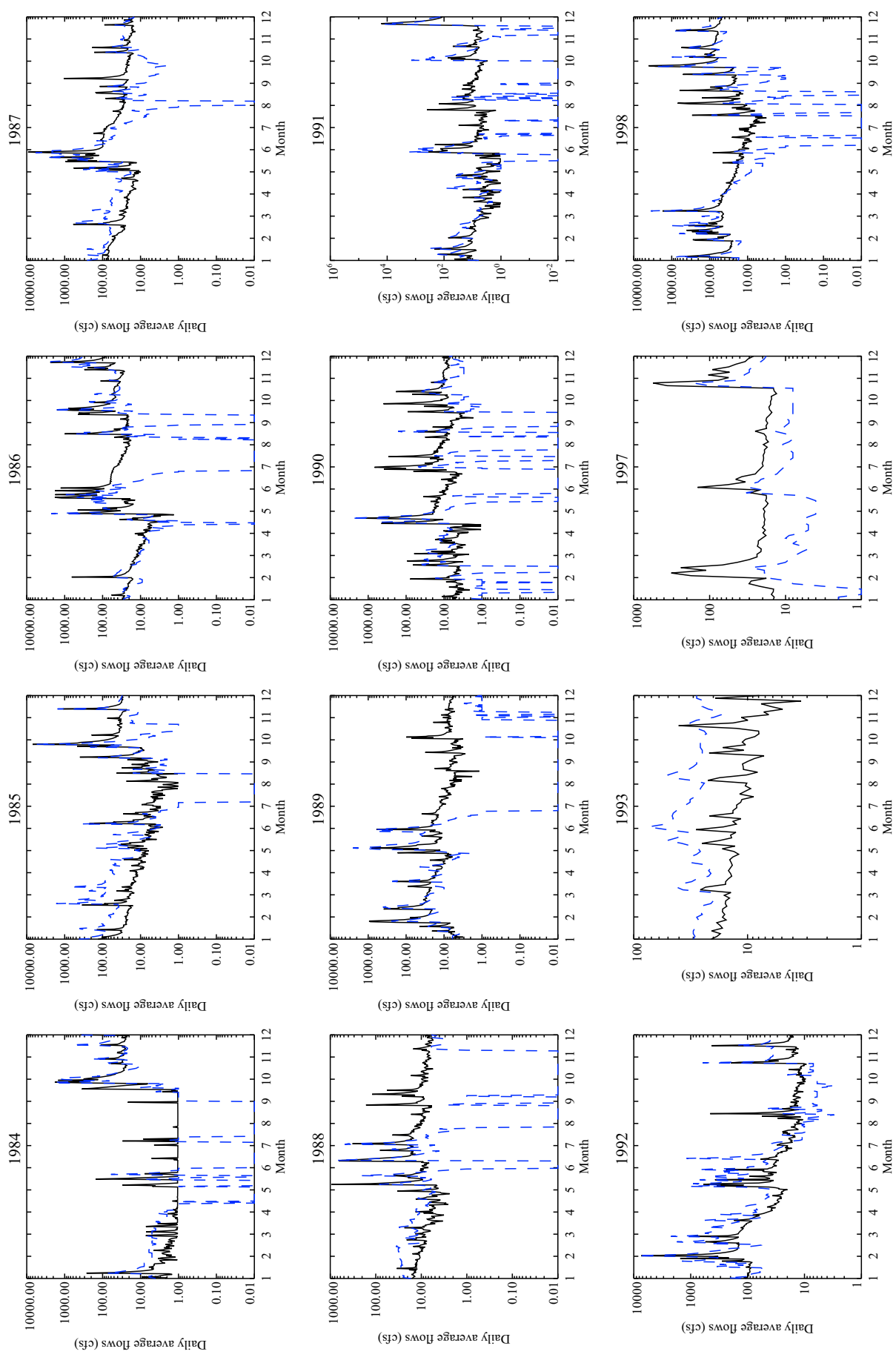
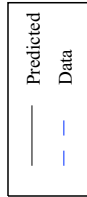


Figure 3-16d. Lake LBJ SWAT model average daily flows calibration for Sandy Creek near Kingsland (Reach 63)

Model run: final.

R2 = 0.57; NS = 0.49; Vol %Diff = -16.42

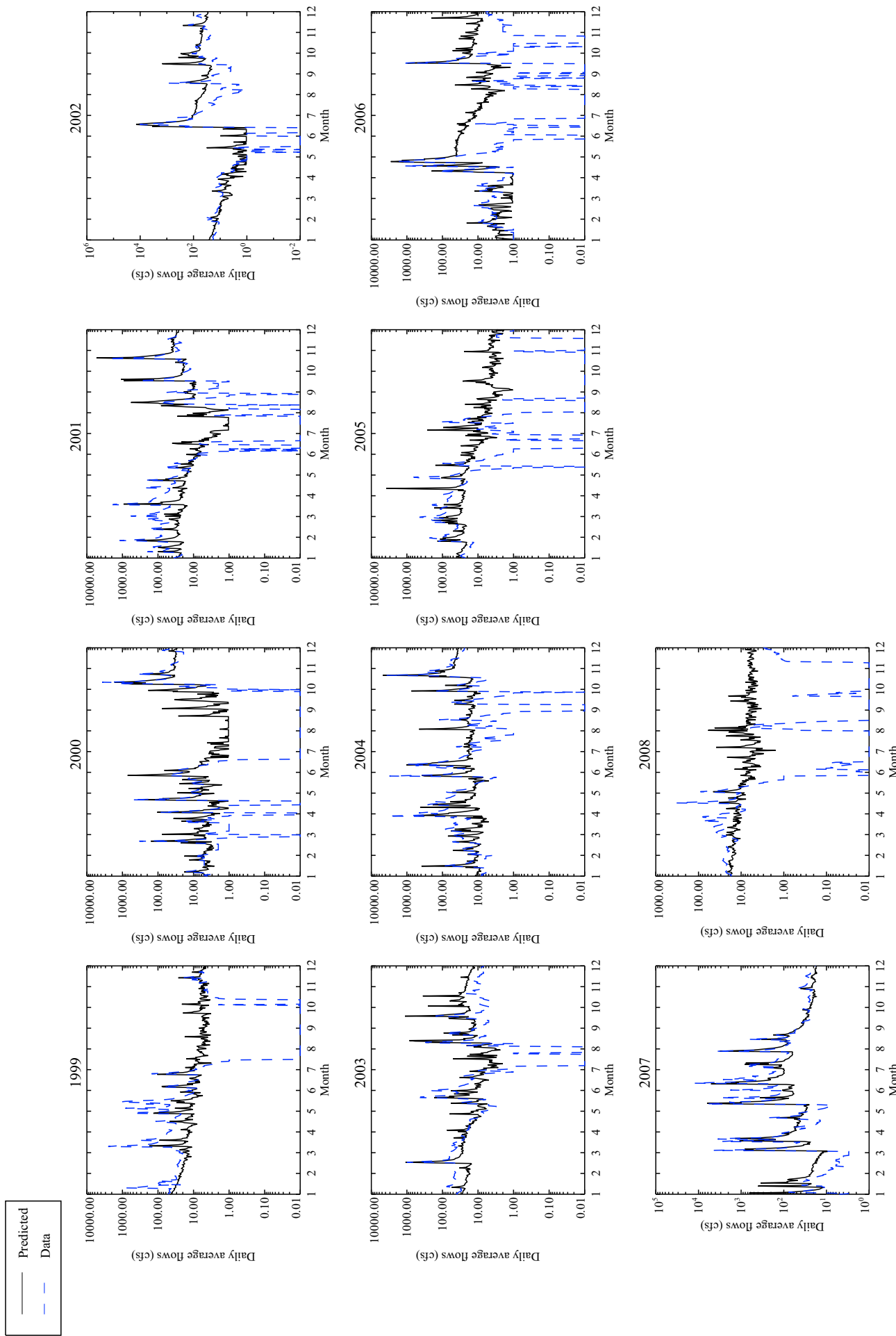


Figure 3-16d. Lake LBJ SWAT model average daily flows calibration for Sandy Creek near Kingsland (Reach 63)

Model run: final.

R2 = 0.57; NS = 0.49; Vol %Diff = -16.42

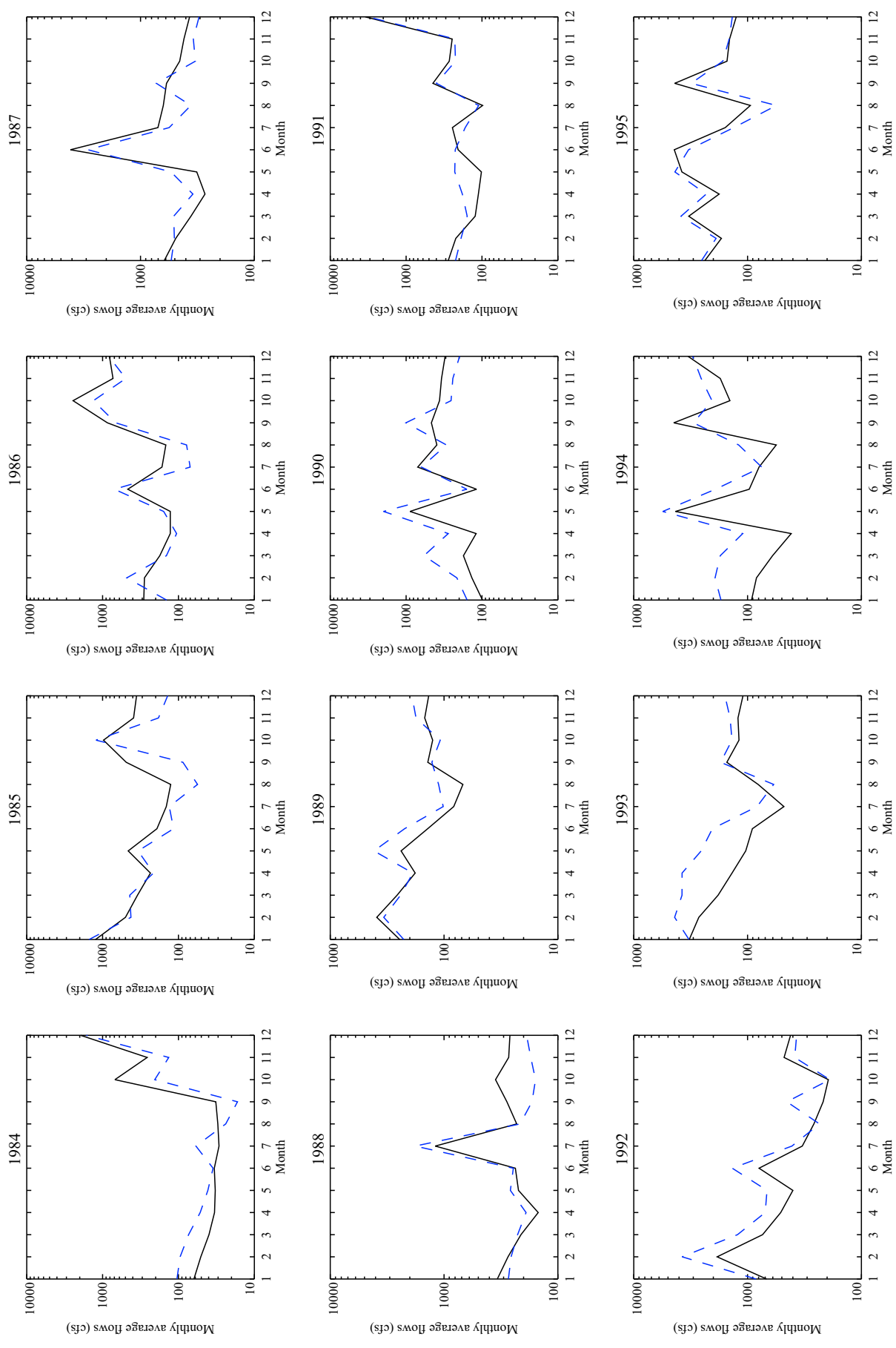
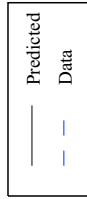


Figure 3-17a. Lake LBJ SWAT model average monthly flows calibration for Llano River at Llano (Reach 13)

Model run: final.
 $R^2 = 0.82$; NS = 0.81; Vol %Diff = 1.77

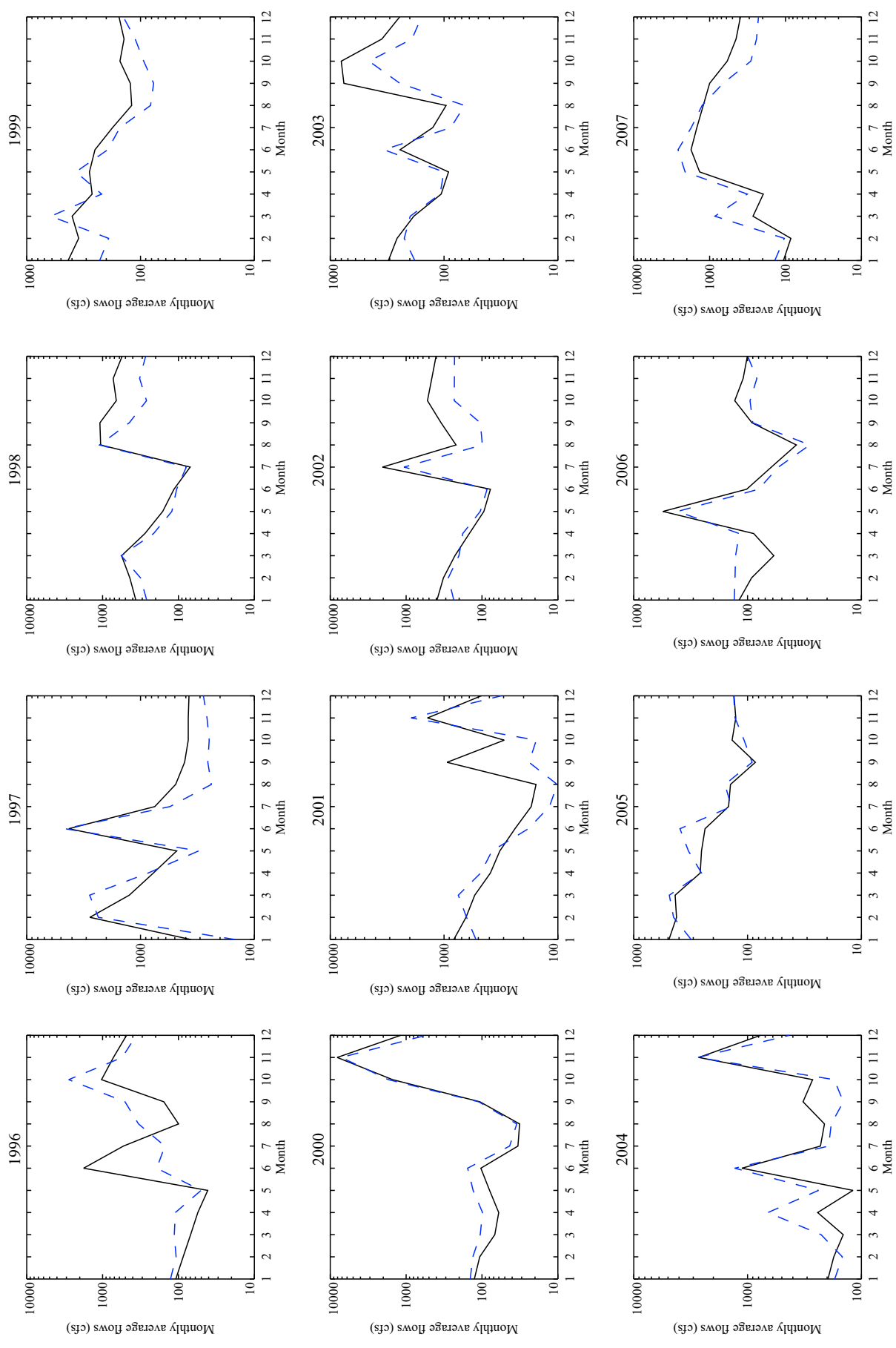
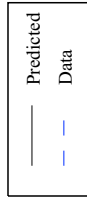


Figure 3-17a. Lake LBJ SWAT model average monthly flows calibration for Llano River at Llano (Reach 13)

Model run: final.
 $R^2 = 0.82$; $NS = 0.81$; $Vol \%Diff = 1.77$

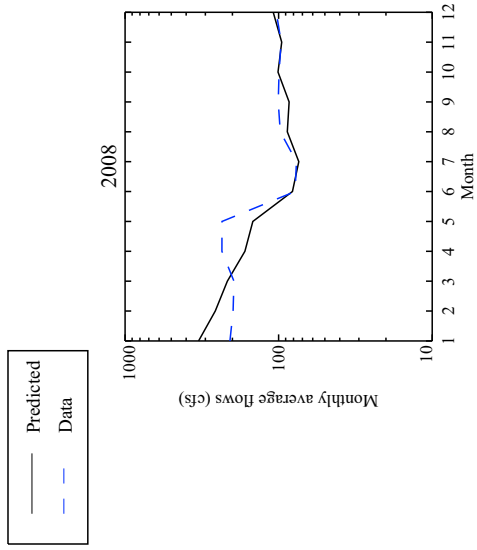


Figure 3-17a. Lake LBJ SWAT model average monthly flows calibration for Llano River at Llano (Reach 13)

Model run: final.
 $R^2 = 0.82$; NS = 0.81; Vol %Diff = 1.77

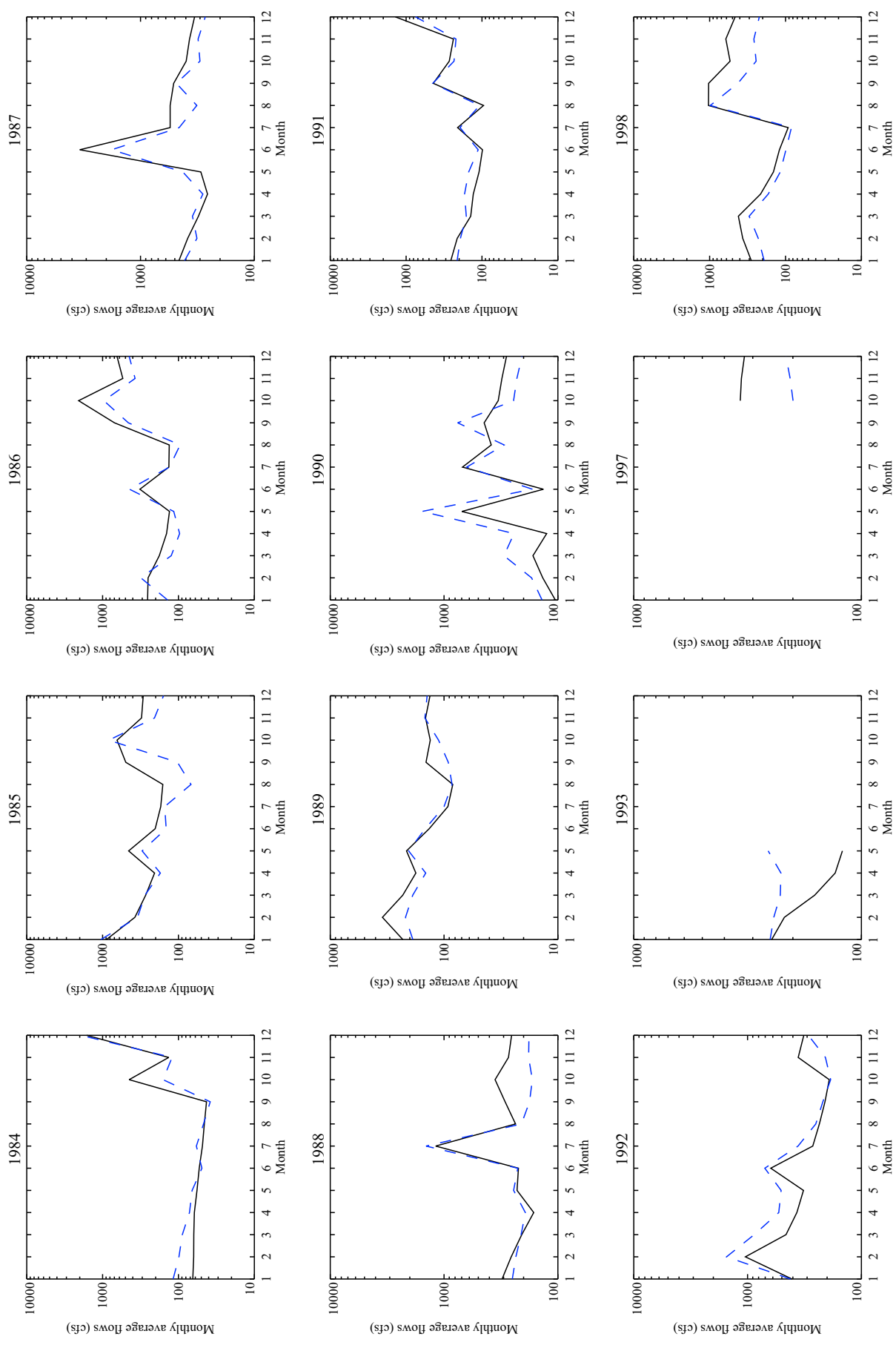
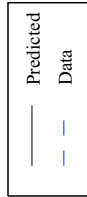


Figure 3-17b. Lake LBJ SWAT model average monthly flows calibration for Llano River near Mason (Reach 32)

Model run: final.
 $R^2 = 0.85$; NS = 0.83; Vol %Diff = 15.00

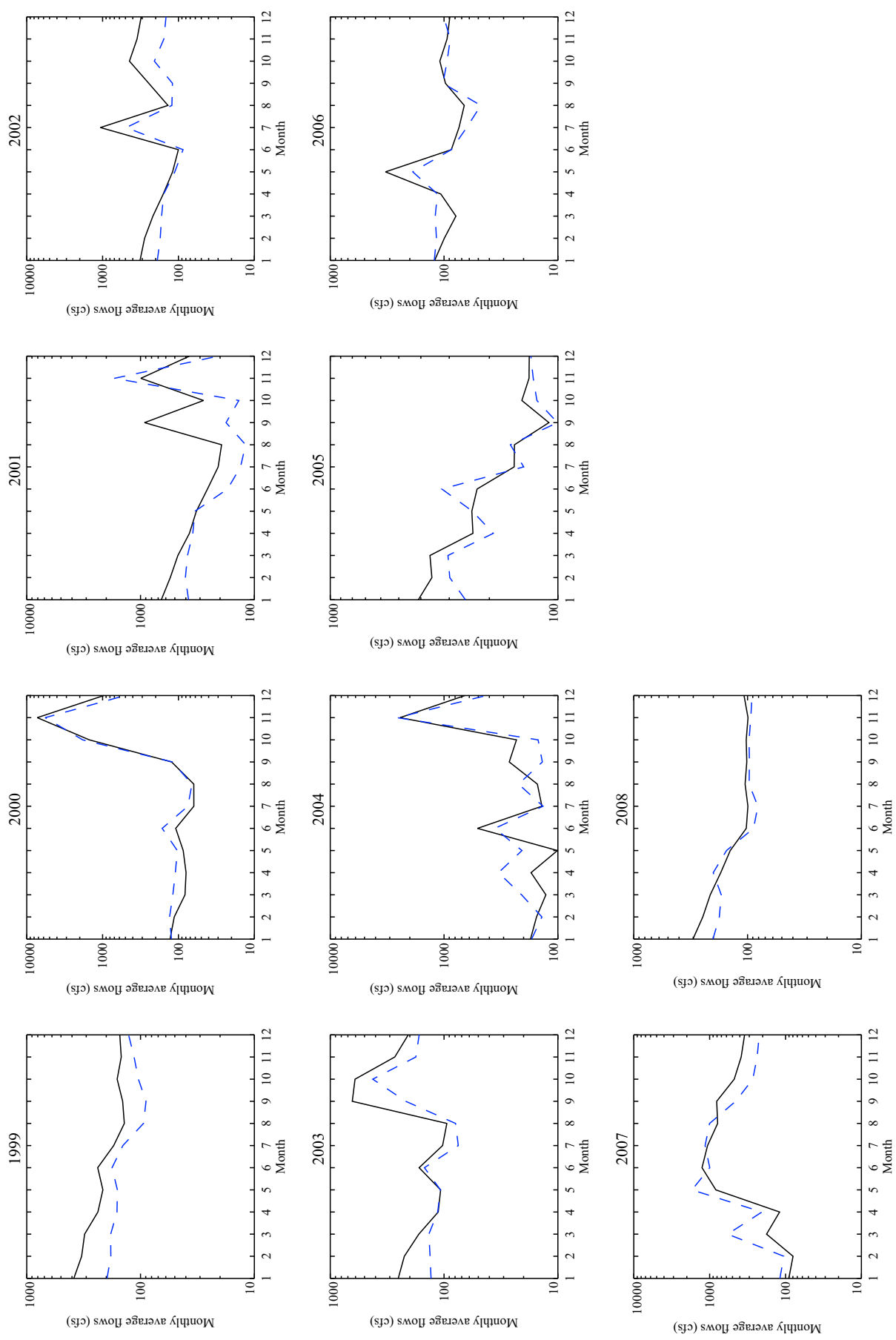
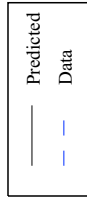


Figure 3-17b. Lake LBJ SWAT model average monthly flows calibration for Llano River near Mason (Reach 32)

Model run: final.
 $R^2 = 0.85$; NS = 0.83; Vol %Diff = 15.00

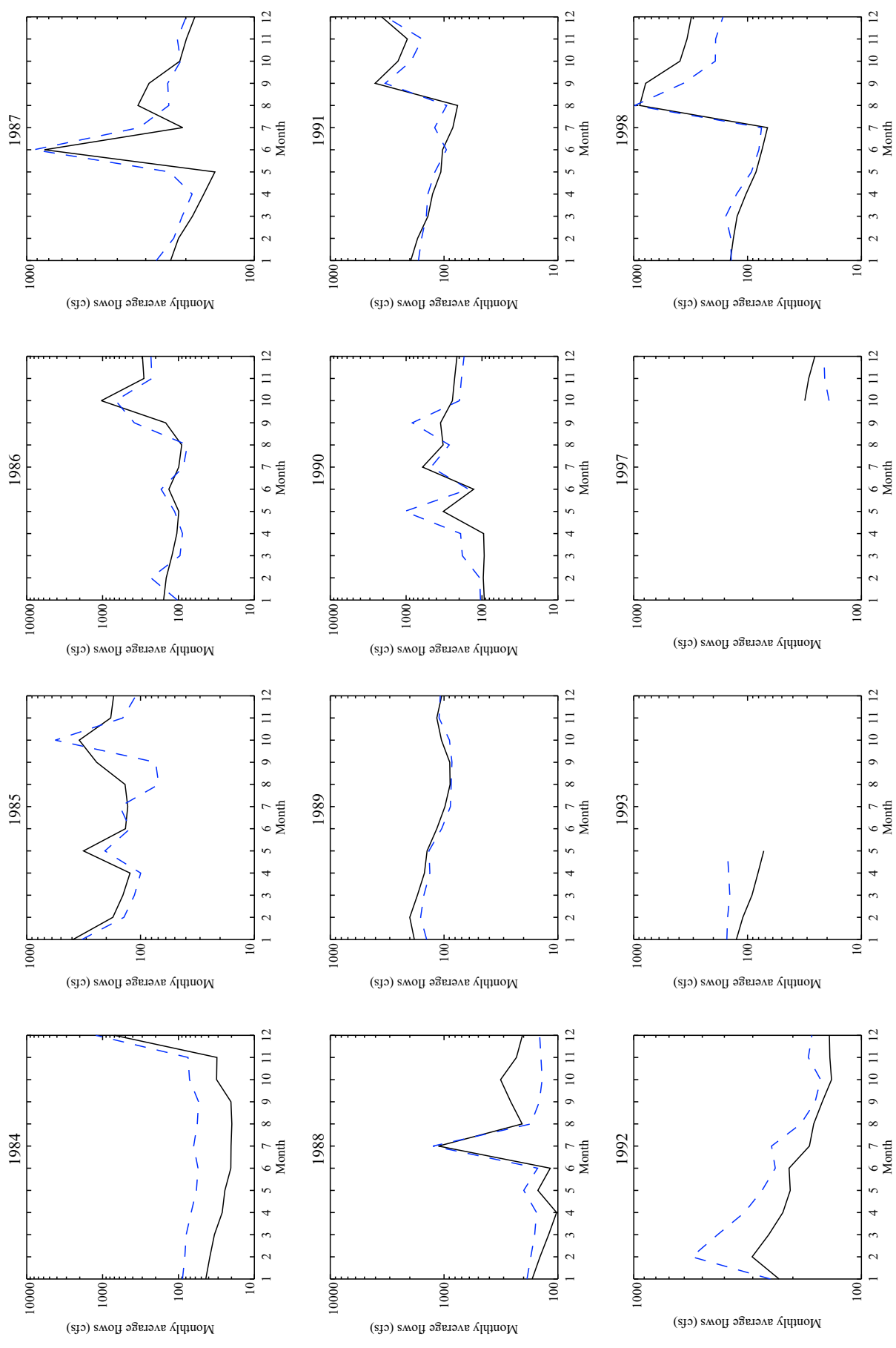
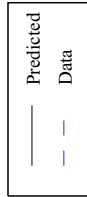


Figure 3-17c. Lake LBJ SWAT model average monthly flows calibration for Llano River near Junction (Reach 69)

Model run: final.
 $R^2 = 0.83$; NS = 0.81; Vol %Diff = -4.06

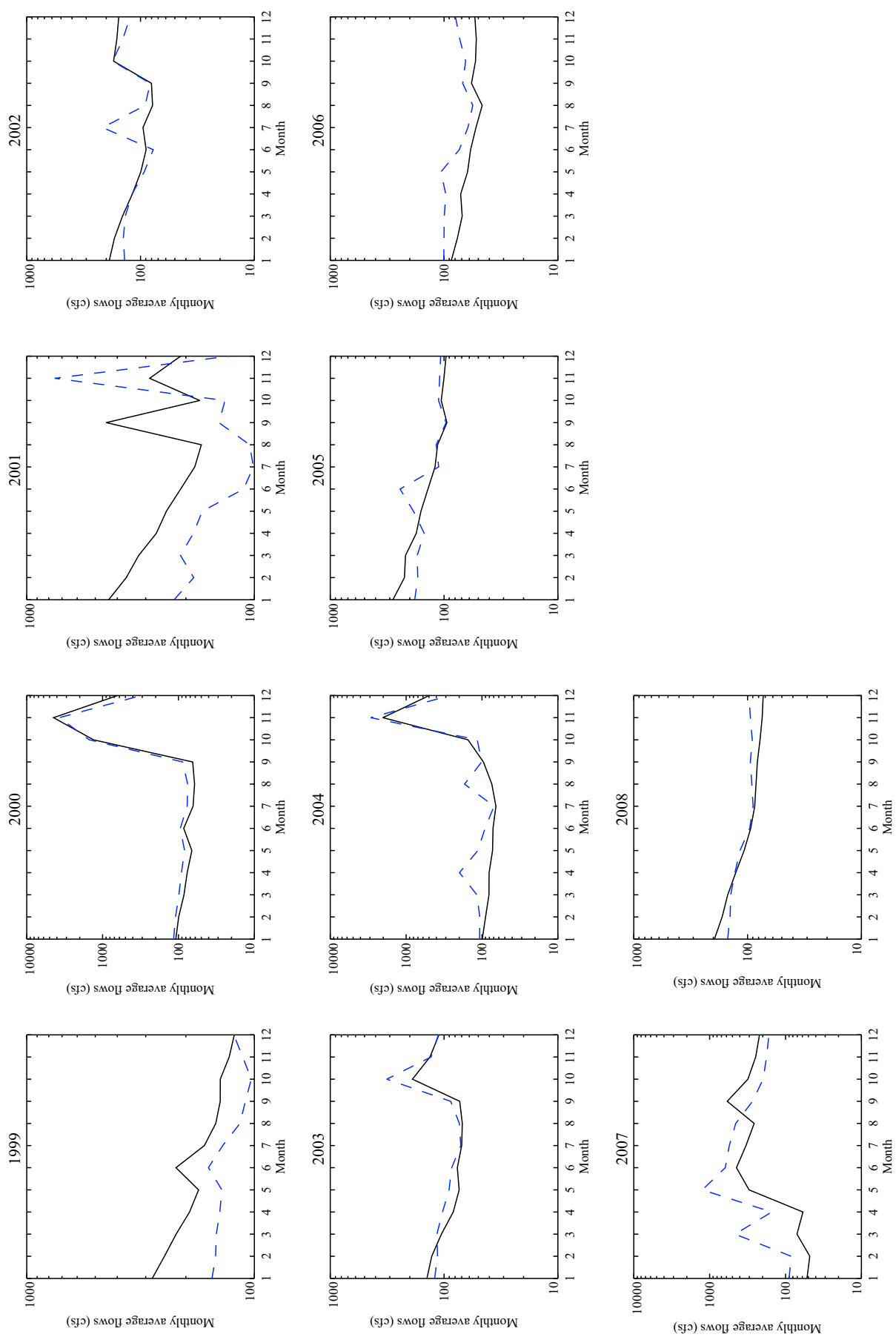
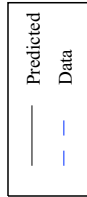


Figure 3-17c. Lake LBJ SWAT model average monthly flows calibration for Llano River near Junction (Reach 69)

Model run: final.
 $R^2 = 0.83$; NS = 0.81; Vol %Diff = -4.06

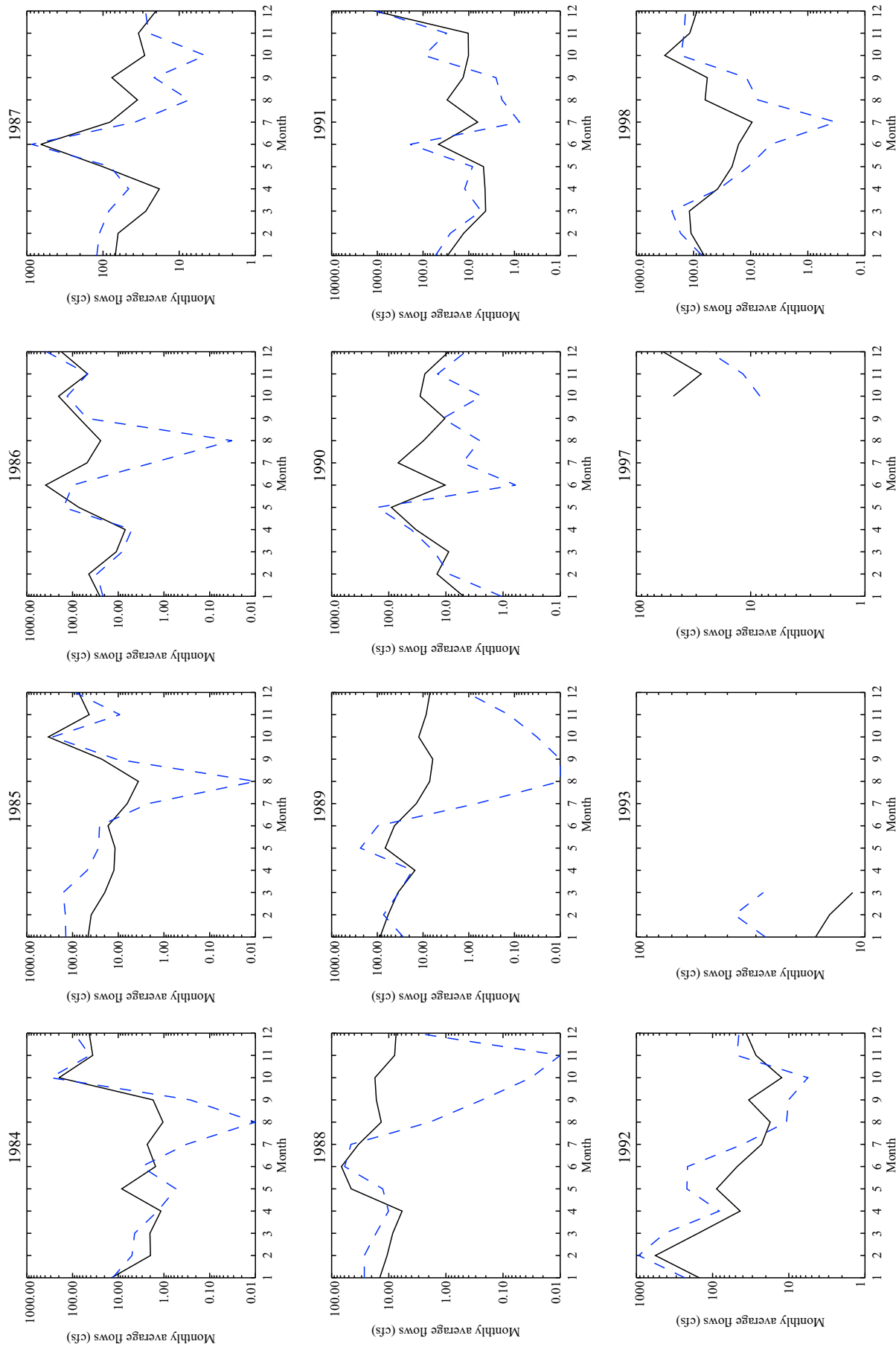
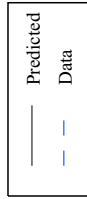


Figure 3-17d. Lake LBJ SWAT model average monthly flows calibration for Sandy Creek near Kingsland (Reach 63)

Model run: final.

$R^2 = 0.69$; NS = 0.62; Vol %Diff = -16.42

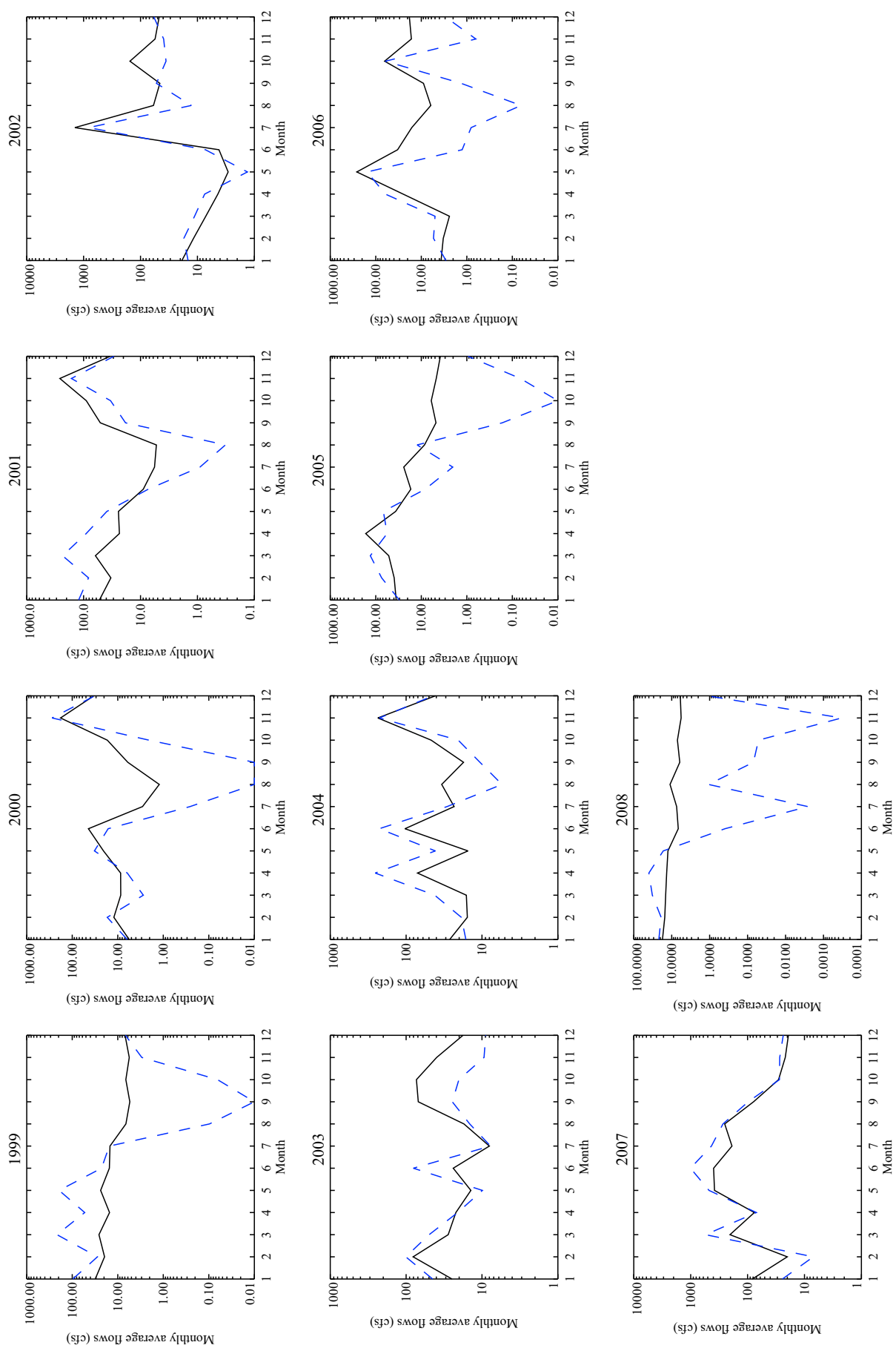
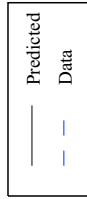


Figure 3-17d. Lake LBJ SWAT model average monthly flows calibration for Sandy Creek near Kingsland (Reach 63)

Model run: final.

R2 = 0.69; NS = 0.62; Vol %Diff = -16.42

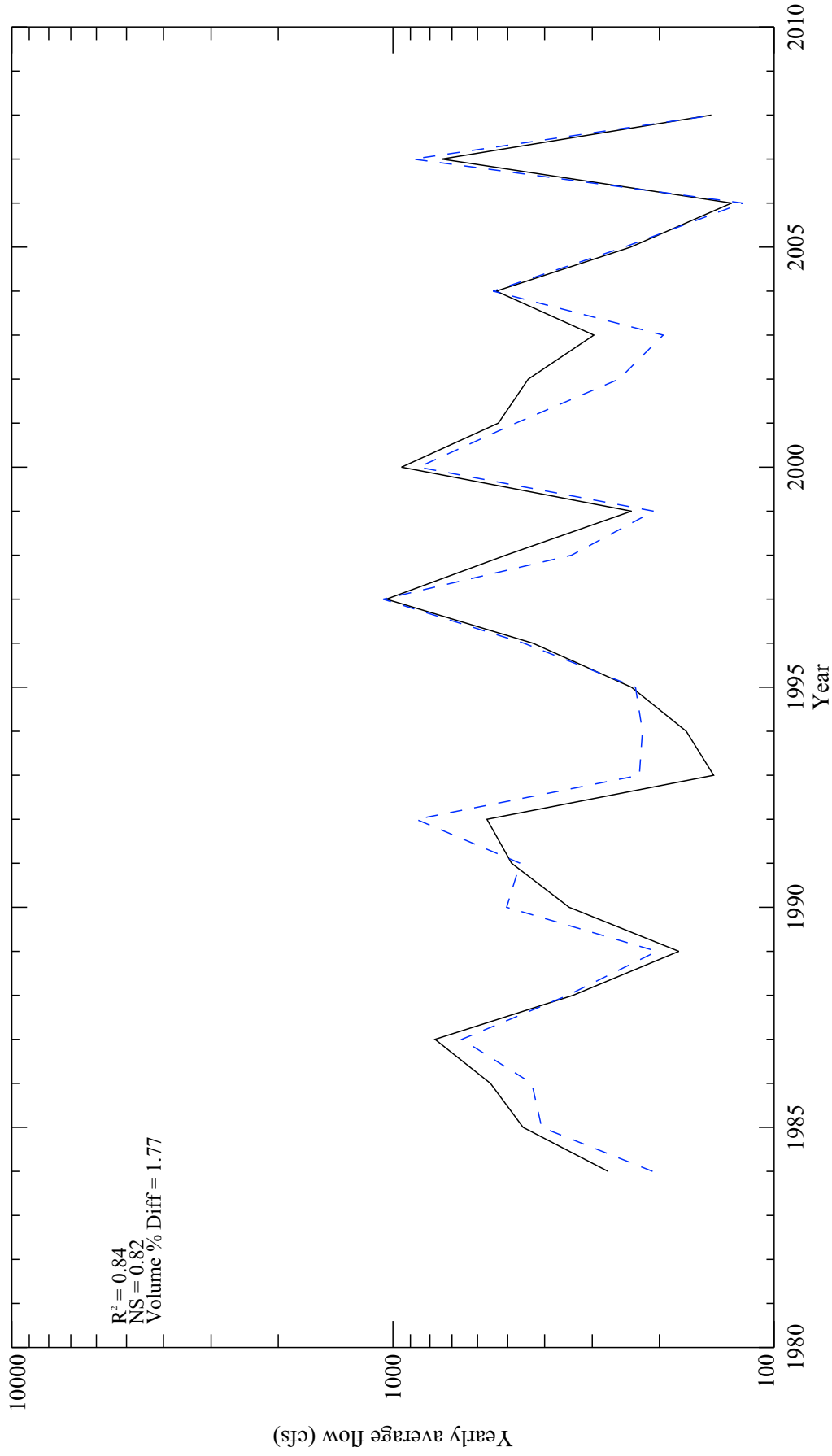
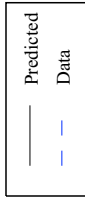


Figure 3-18a. Lake LBJ SWAT model average annual flows calibration for Llano River at Llano (Reach 13)

Averages calculated from hourly values.

Model run: final.

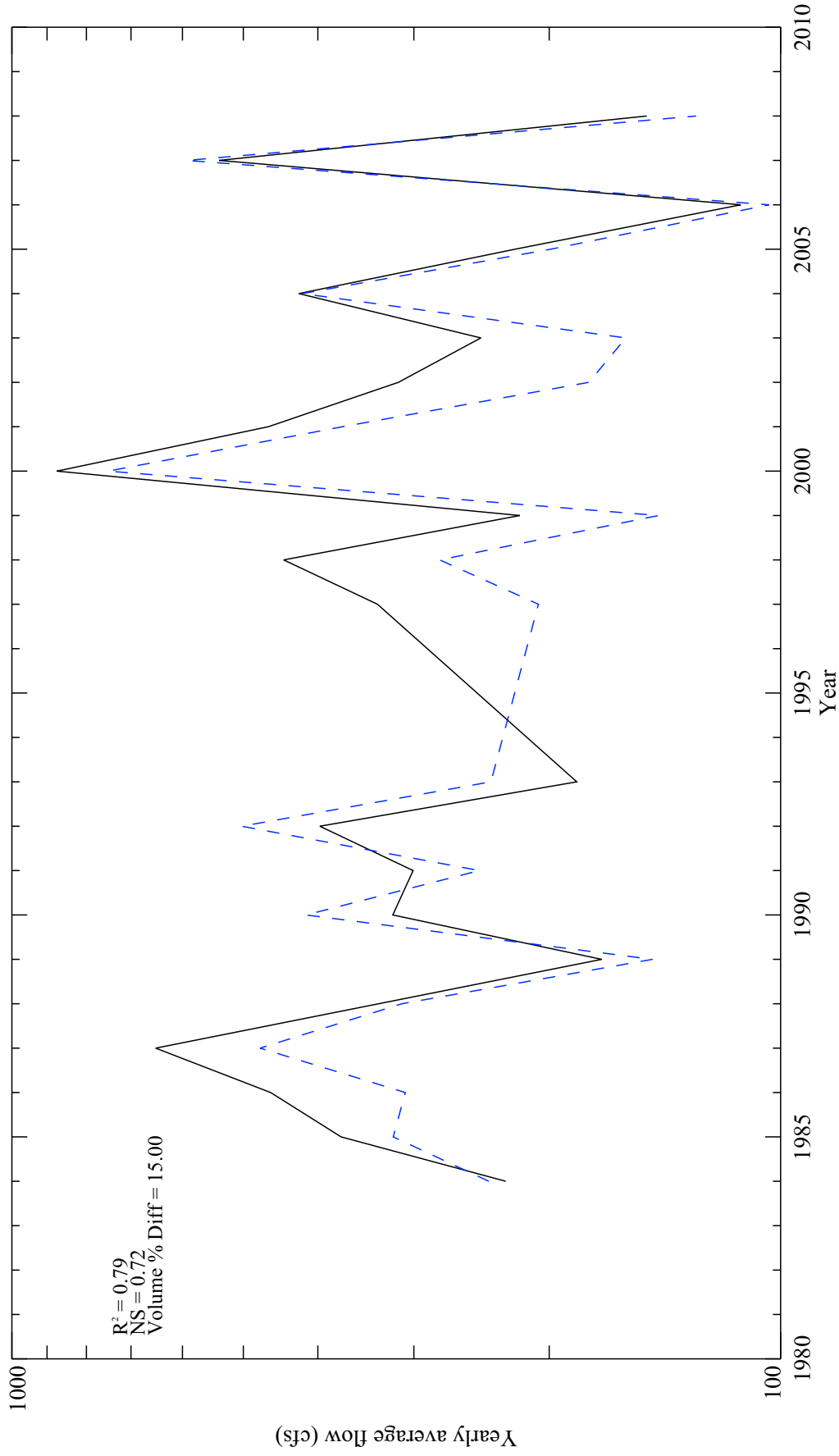
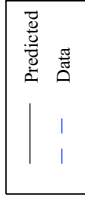


Figure 3-18b. Lake LBJ SWAT model average annual flows calibration for Llano River near Mason (Reach 32)

Averages calculated from hourly values.

Model run: final.

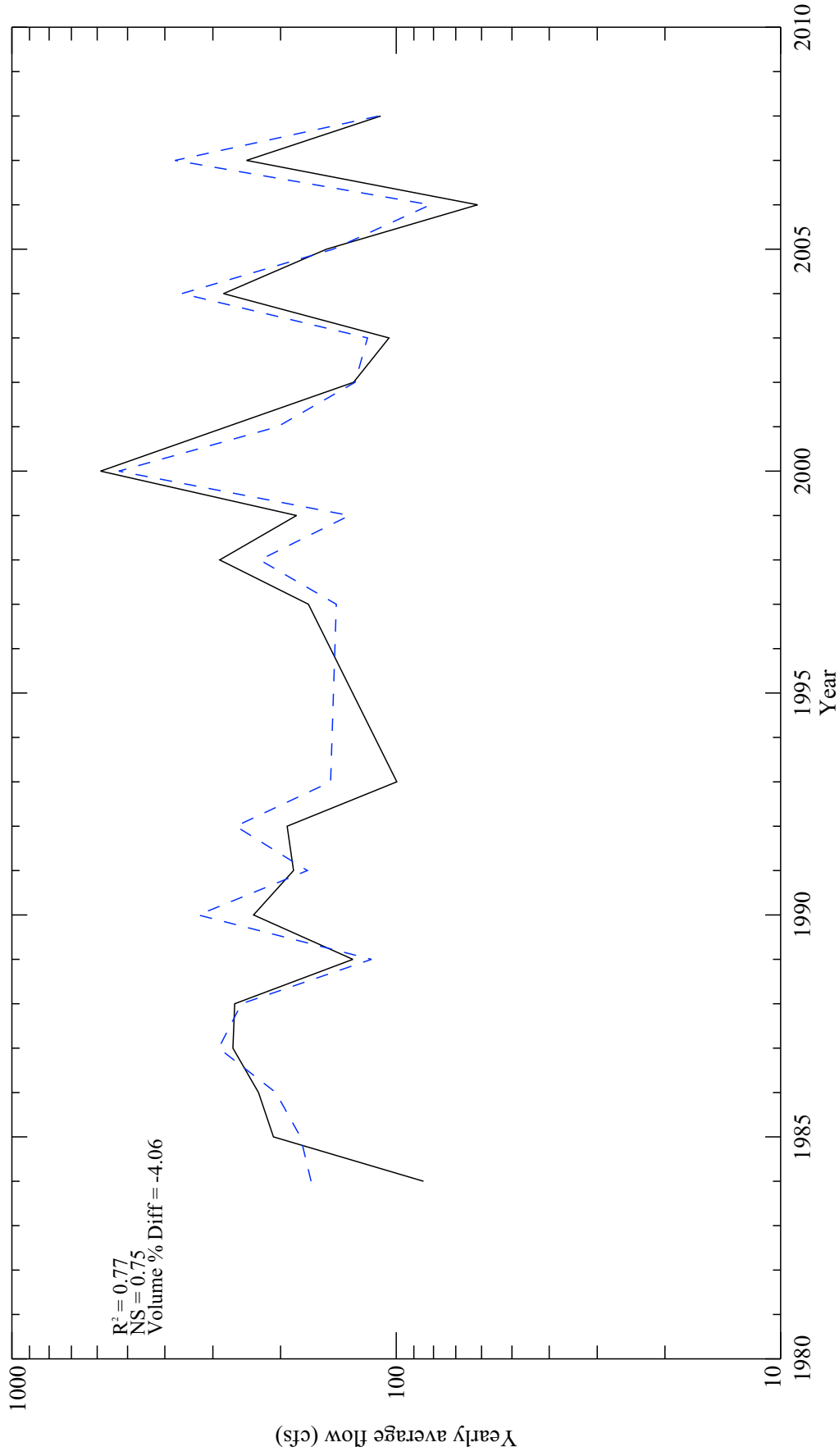
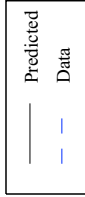


Figure 3-18c. Lake LBJ SWAT model average annual flows calibration for Llano River near Junction (Reach 69)

Averages calculated from hourly values.

Model run: final.

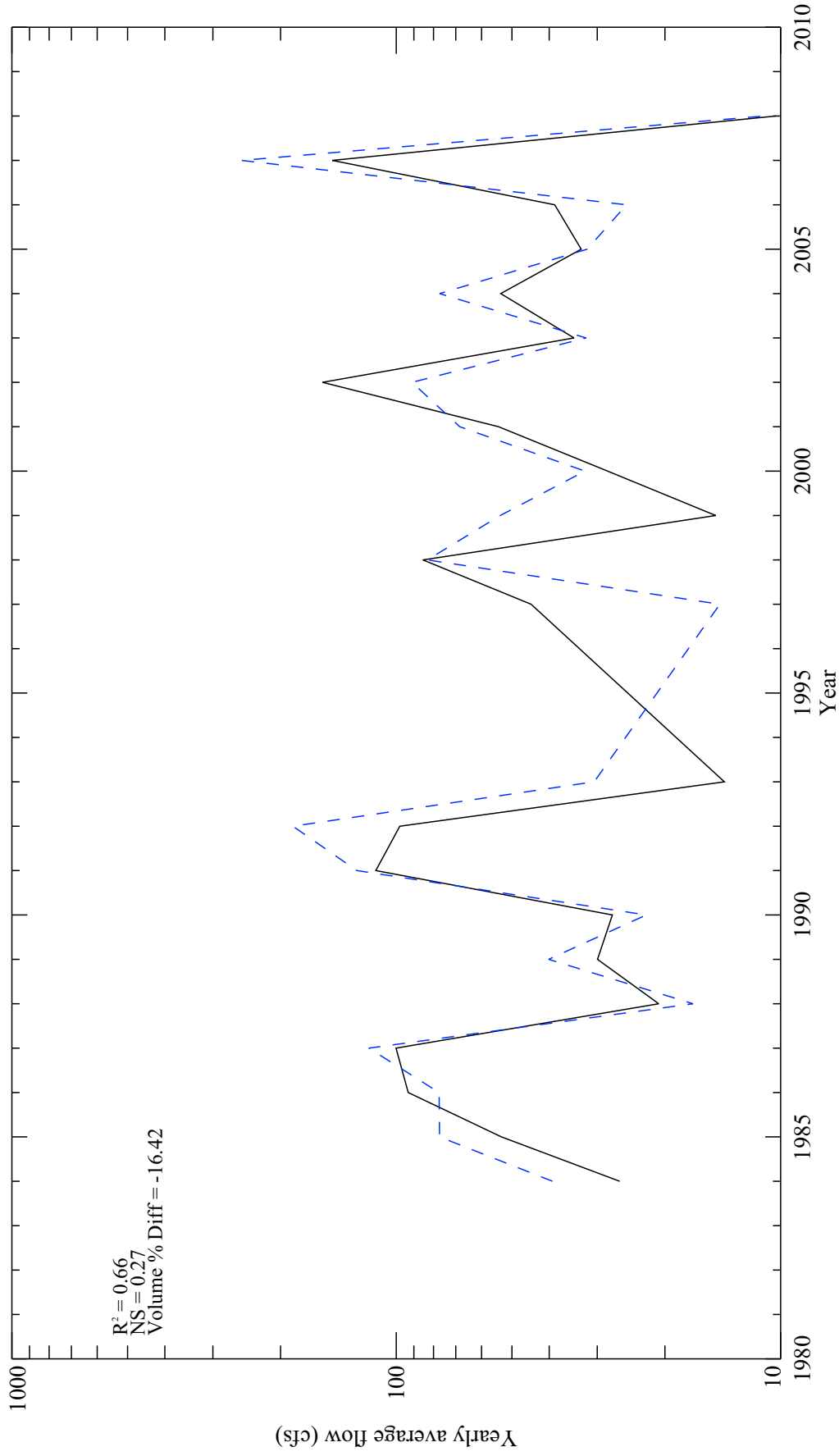
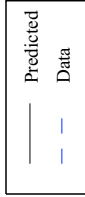


Figure 3-18d. Lake LBJ SWAT model average annual flows calibration for Sandy Creek near Kingsland (Reach 63)

Averages calculated from hourly values.

Model run: final.

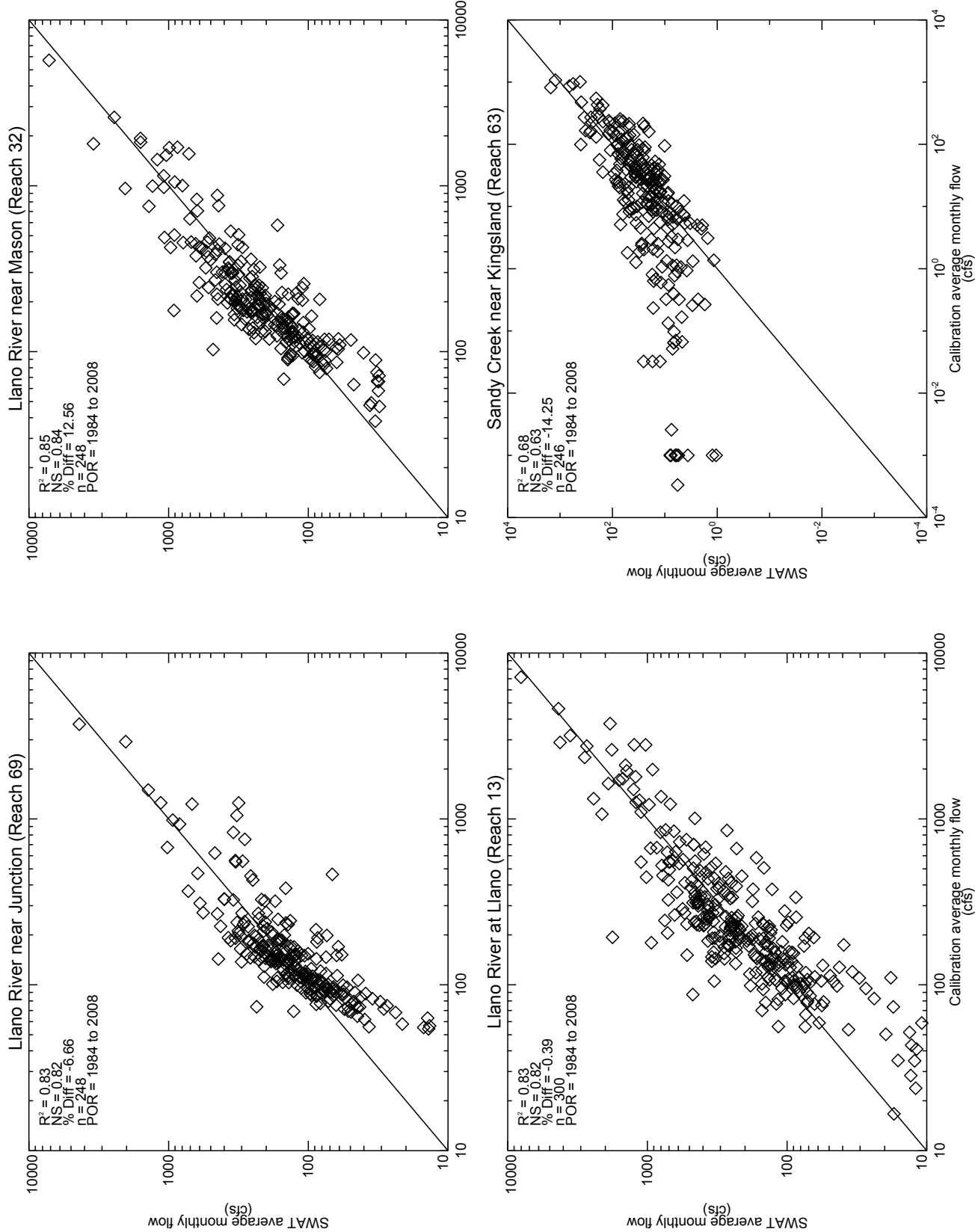


Figure 19. Lake LBJ SWAT model monthly average flow calibration by reach.

Model run: 20100803a.
 Calibration values are measured USGS.
 Calibration values of 0 are plotted as 0.001.
 ARC - C:\Jobs\PAR\rm\LBJS\scenarios\IDL_code\parcm_xy_20090709.pro
 Tue Aug 03 14:13:29 2010

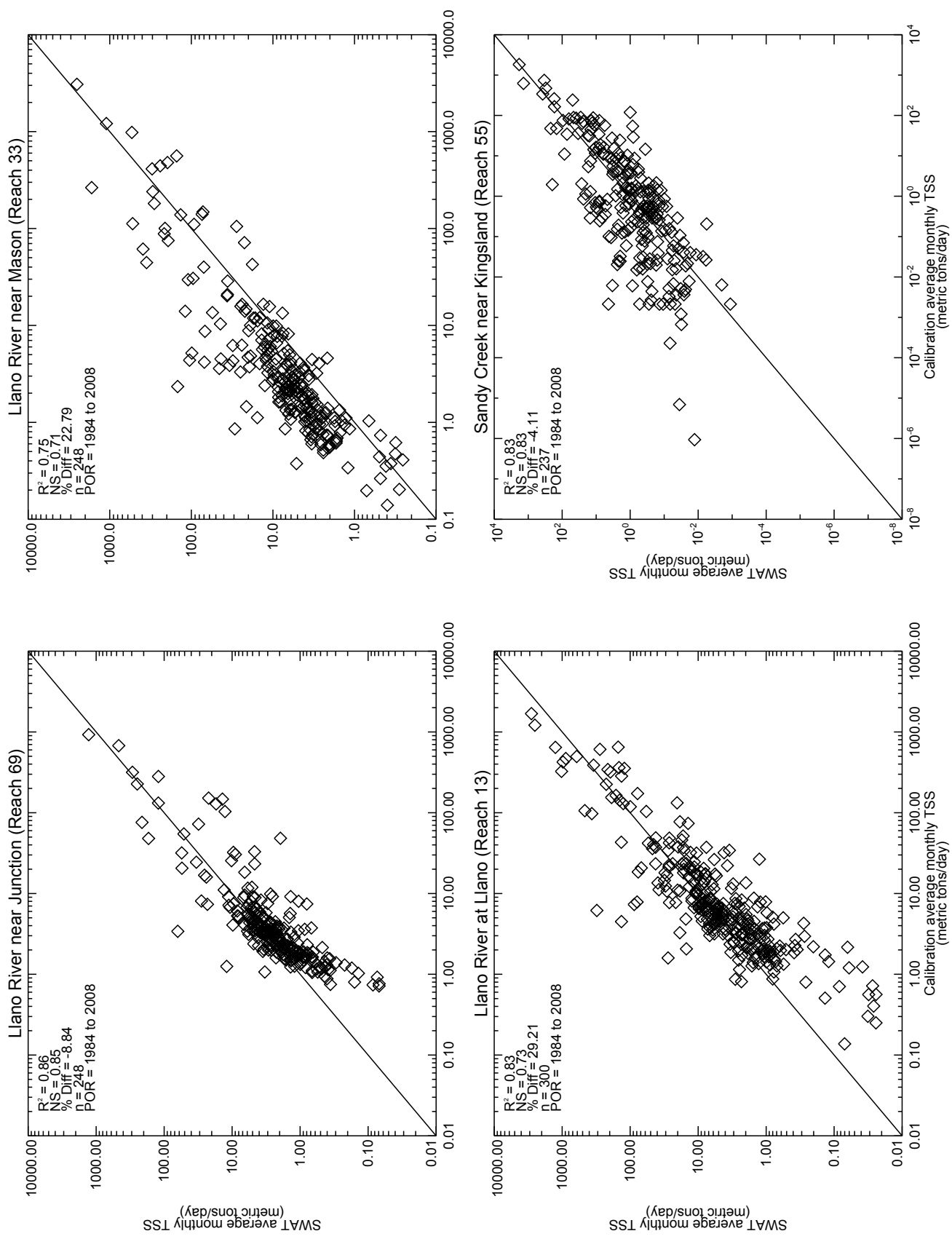


Figure 20. Lake LBJ SWAT model monthly average TSS calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

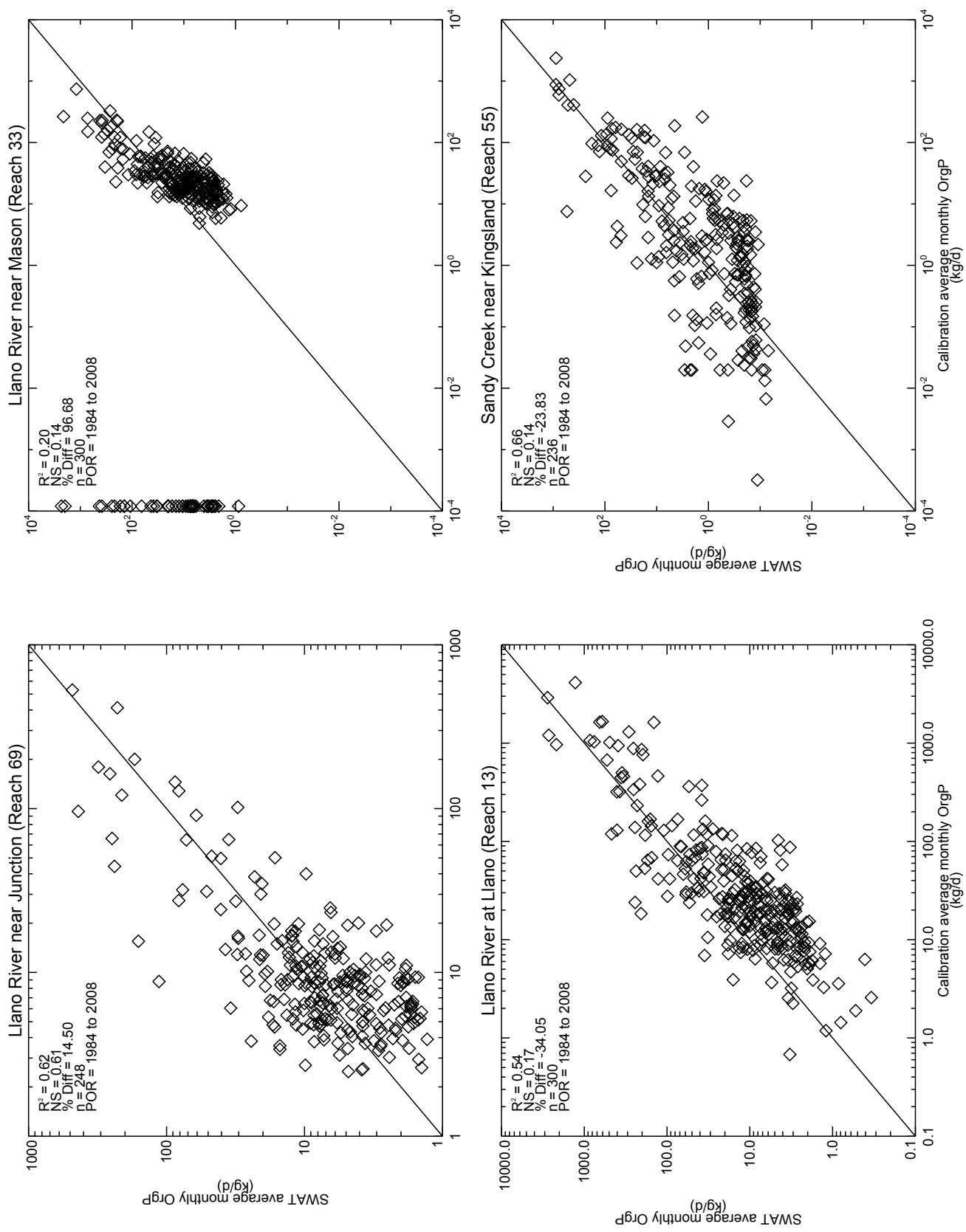


Figure 21a. Lake LBJ SWAT model monthly average OrgP calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

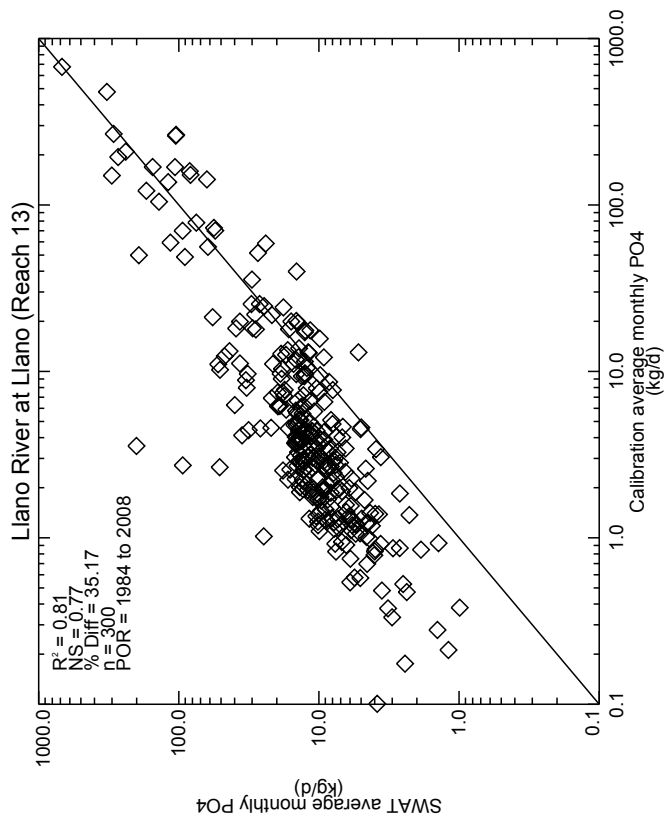
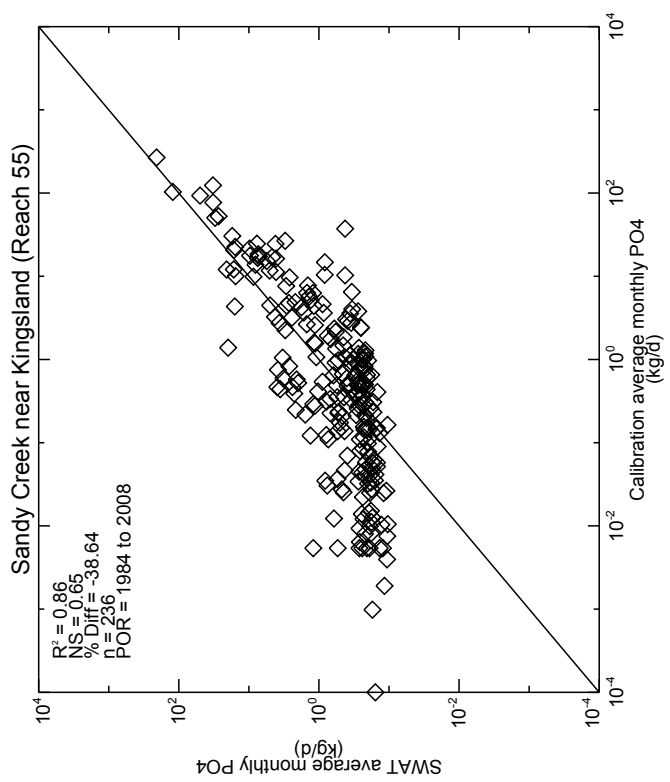


Figure 21b. Lake LBJ SWAT model monthly average PO4 calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

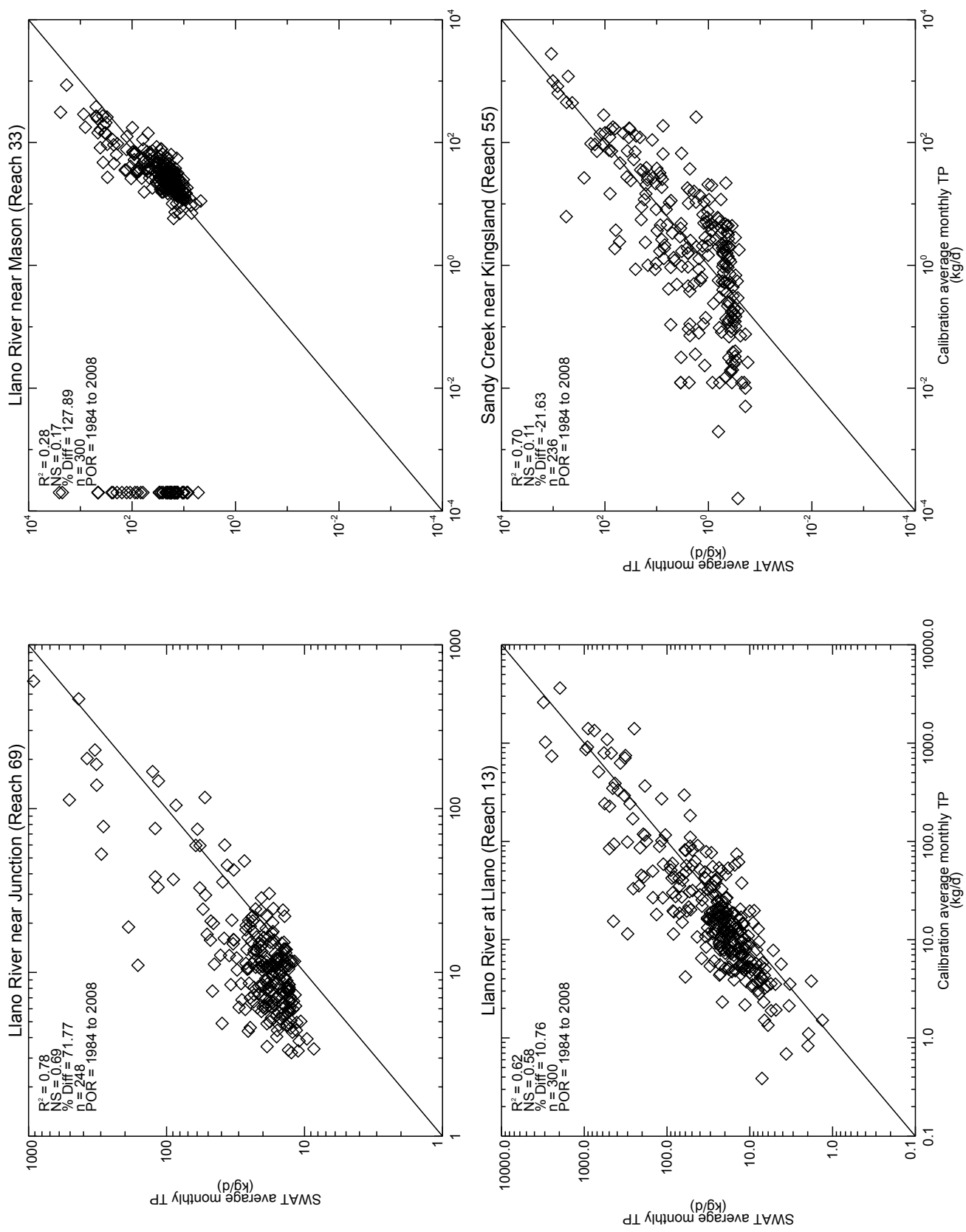


Figure 21c. Lake LBJ SWAT model monthly average TP calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

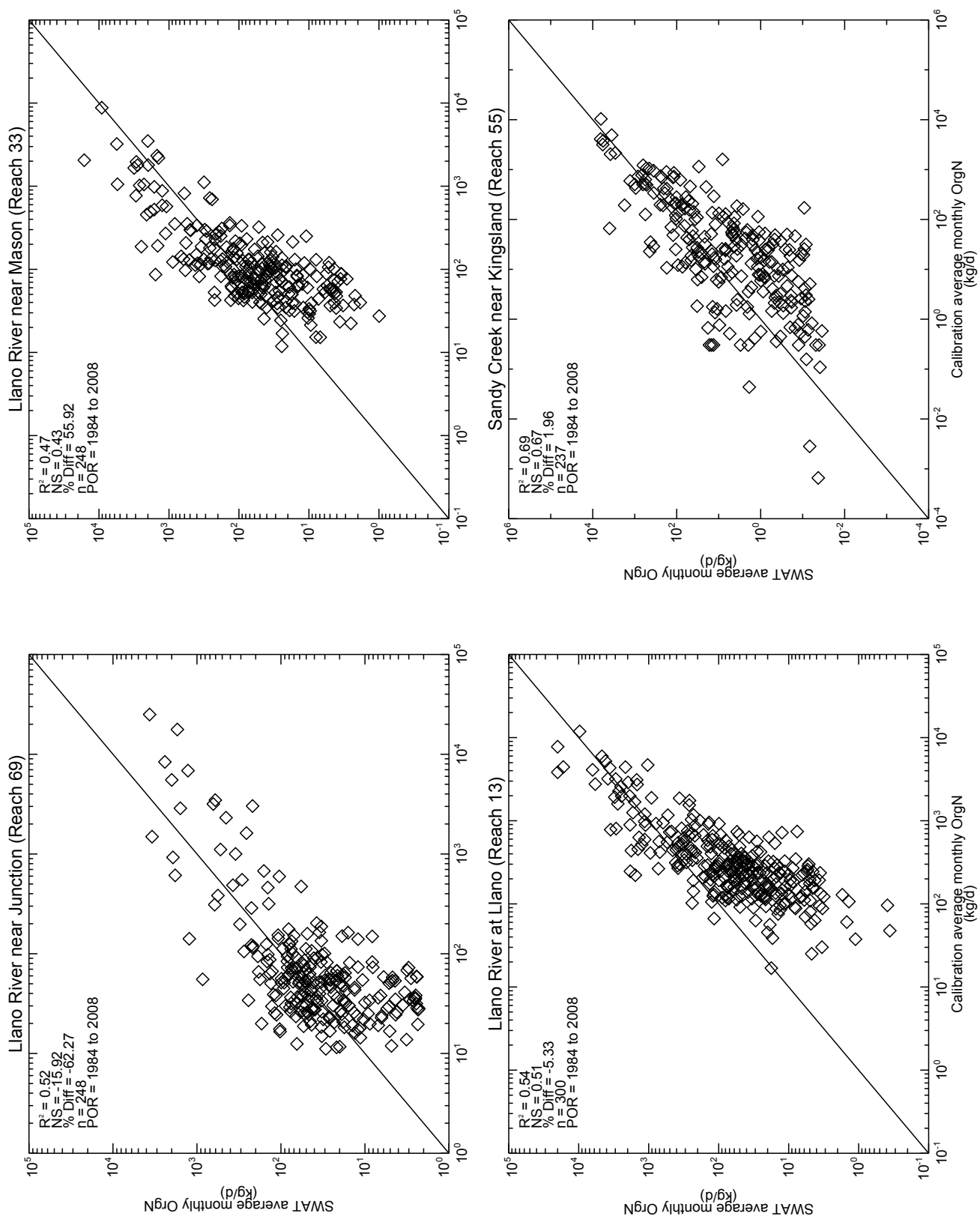


Figure 21d. Lake LBJ SWAT model monthly average OrgN calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

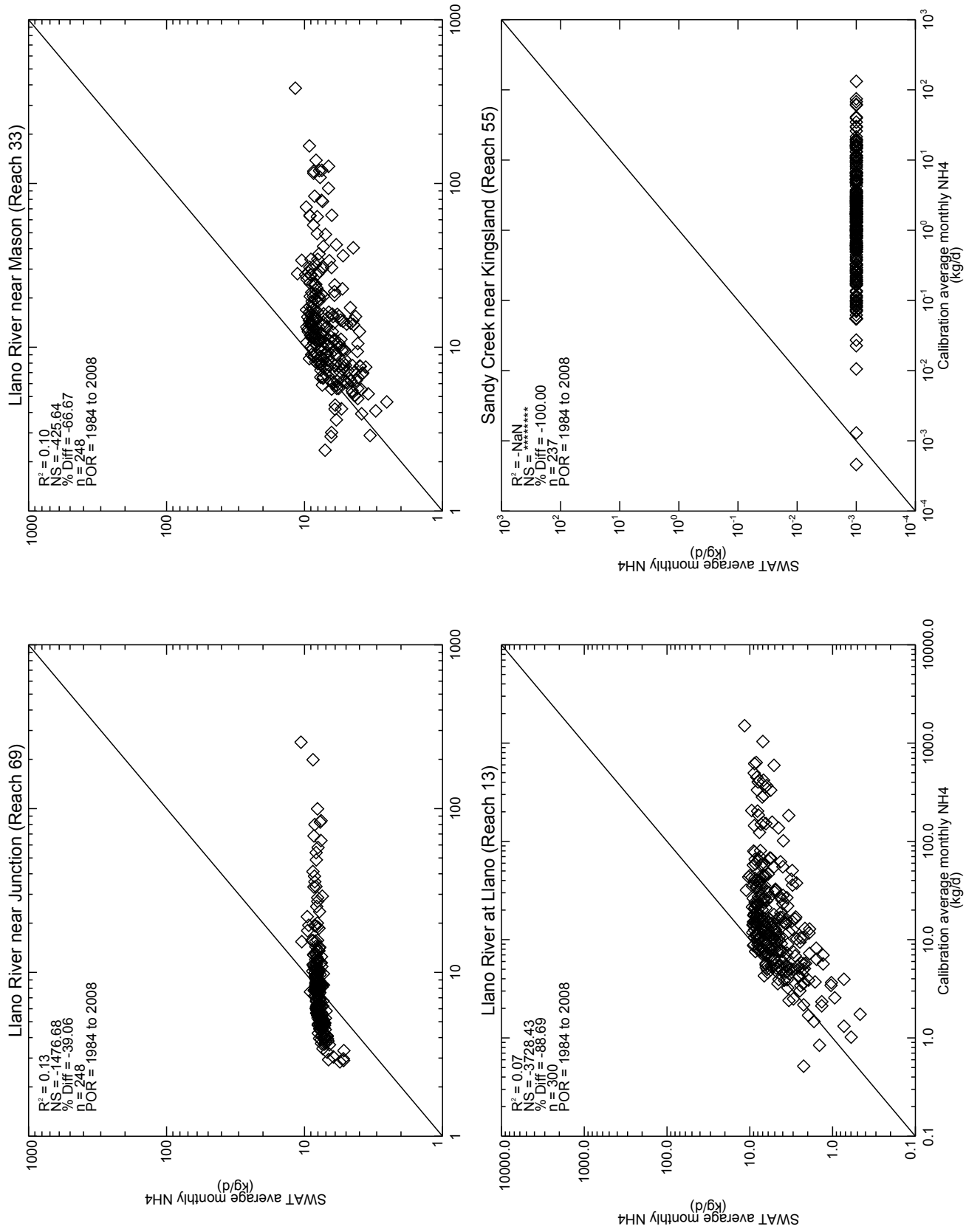


Figure 21e. Lake LBJ SWAT model monthly average NH4 calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

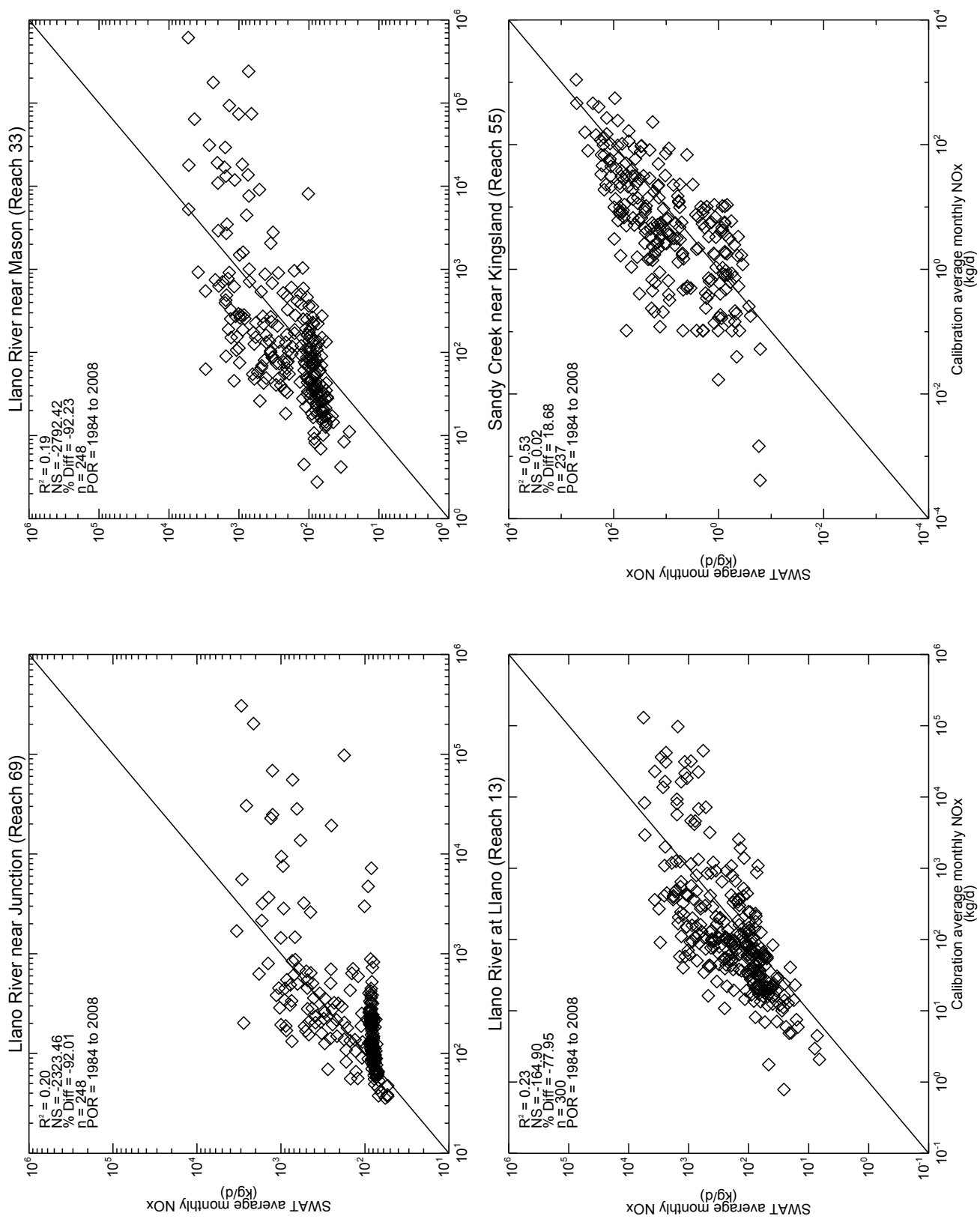


Figure 21f. Lake LBJ SWAT model monthly average NOx calibration by reach.

Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.

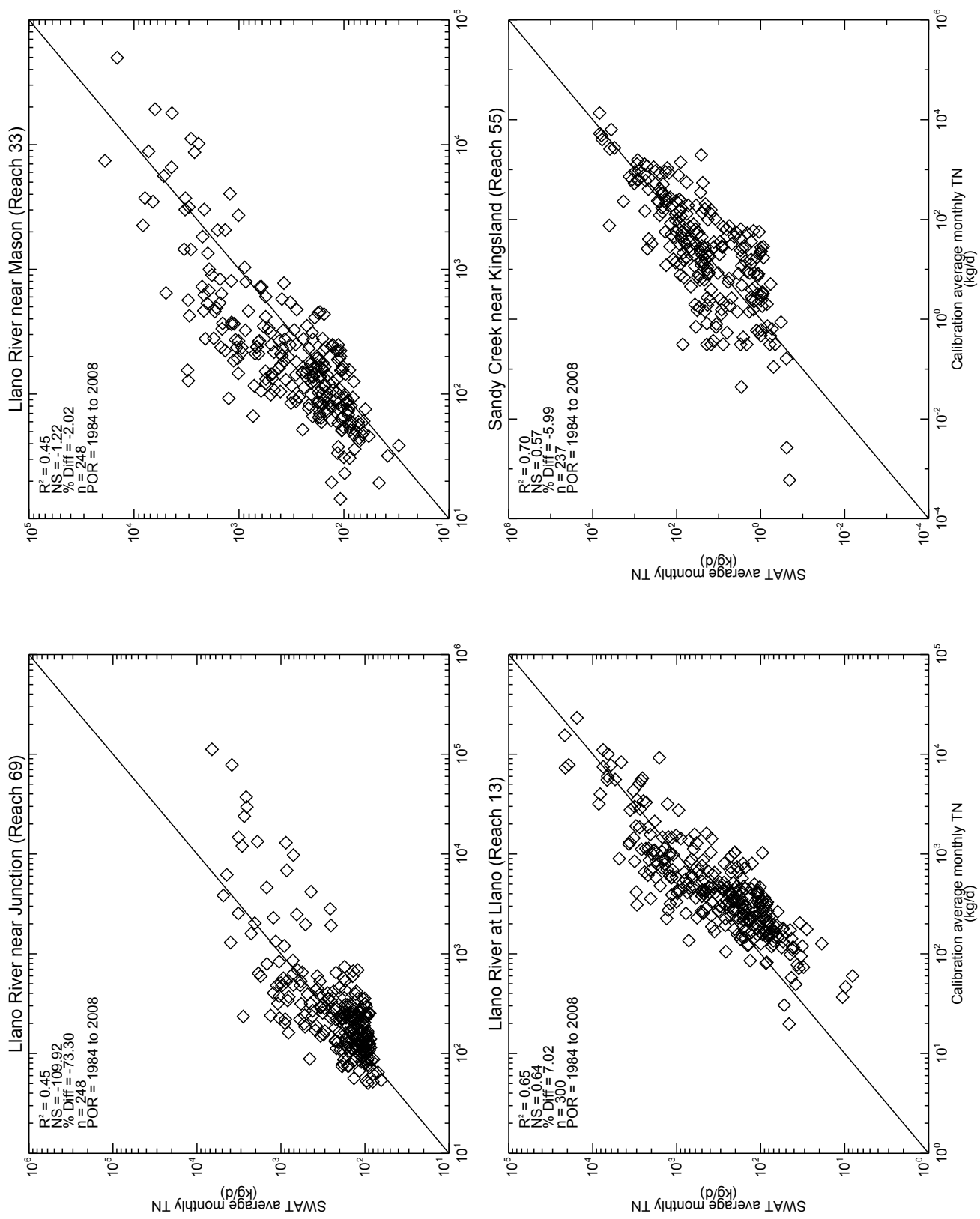
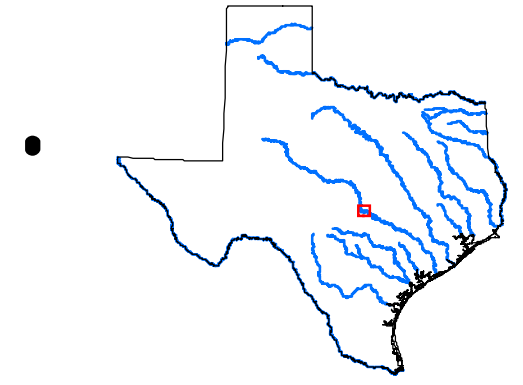
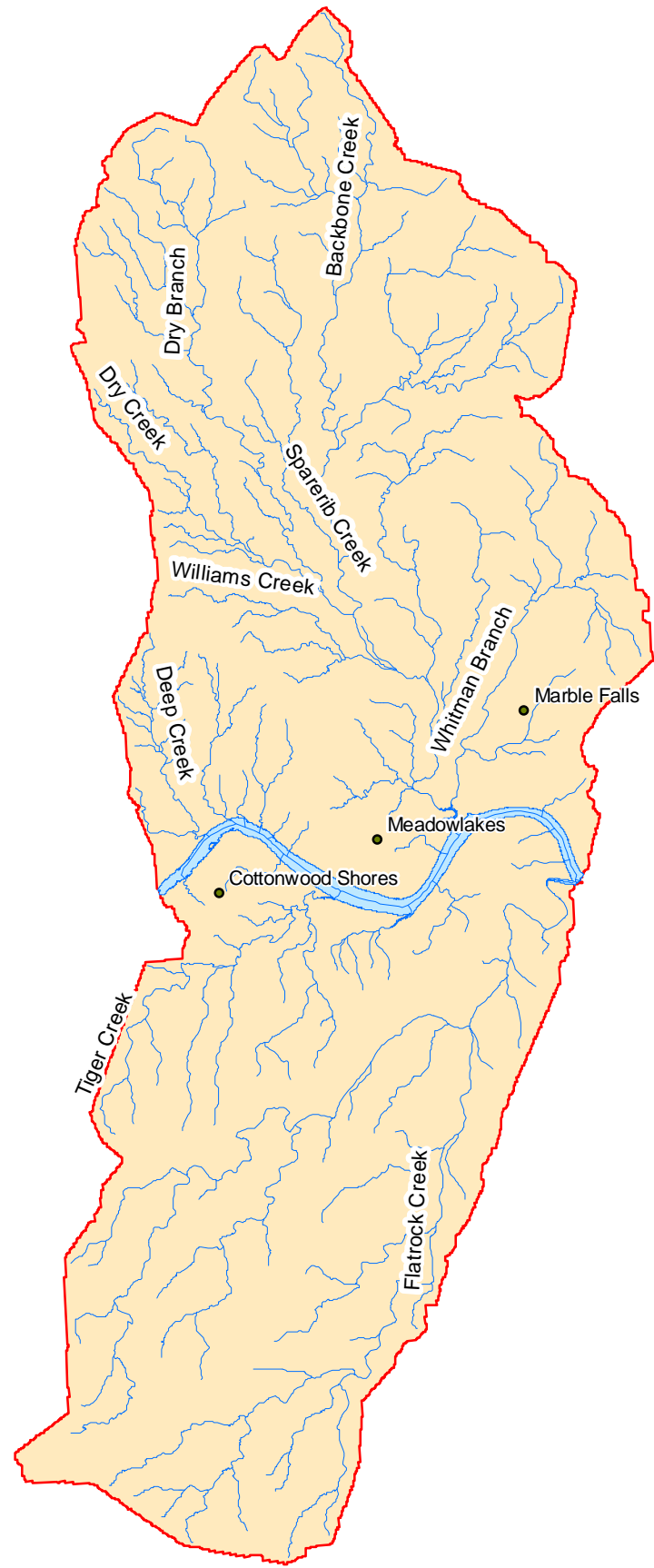


Figure 21g. Lake LBJ SWAT model monthly average TN calibration by reach.

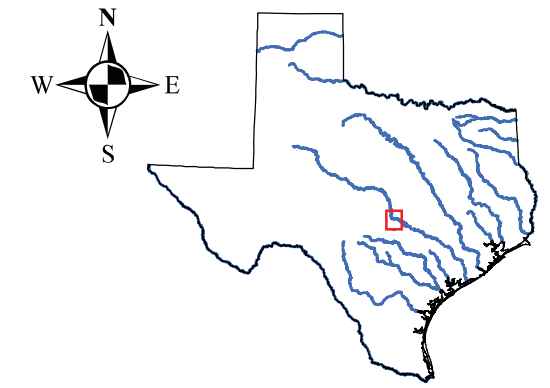
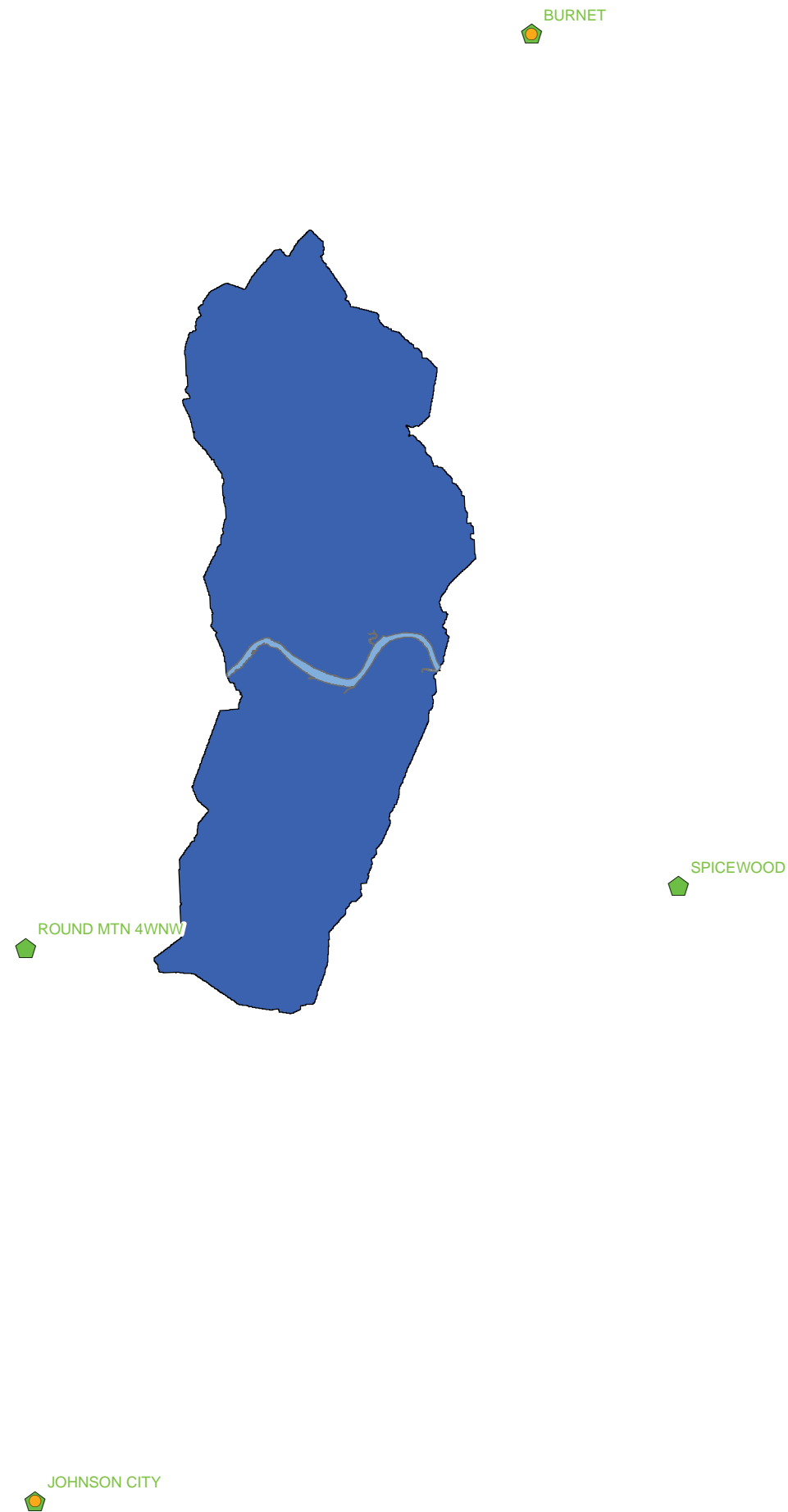
Model run: 20100803a.
 Calibration values are calculated from USGS flows and LOADEST rating curves.
 Calibration values of 0 are plotted as 0.001.





Legend

 Lake Marble Falls Watershed

Figure 3-22.
 Lake Marble Falls Watershed
 and Stream Network



Legend

-  Precipitation Gage
-  Temperature Gage

 Lake Marble Falls

Precipitation (inches)

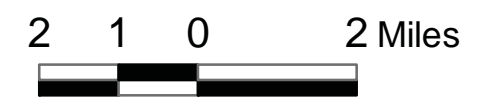
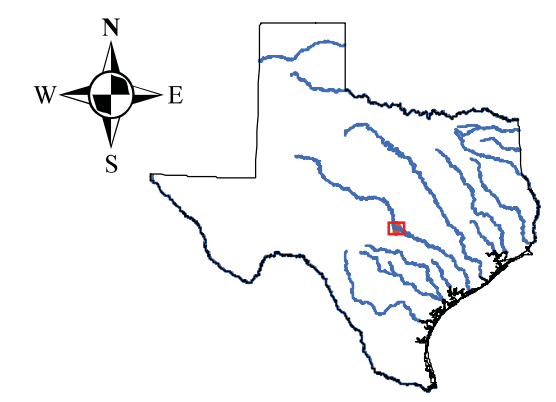
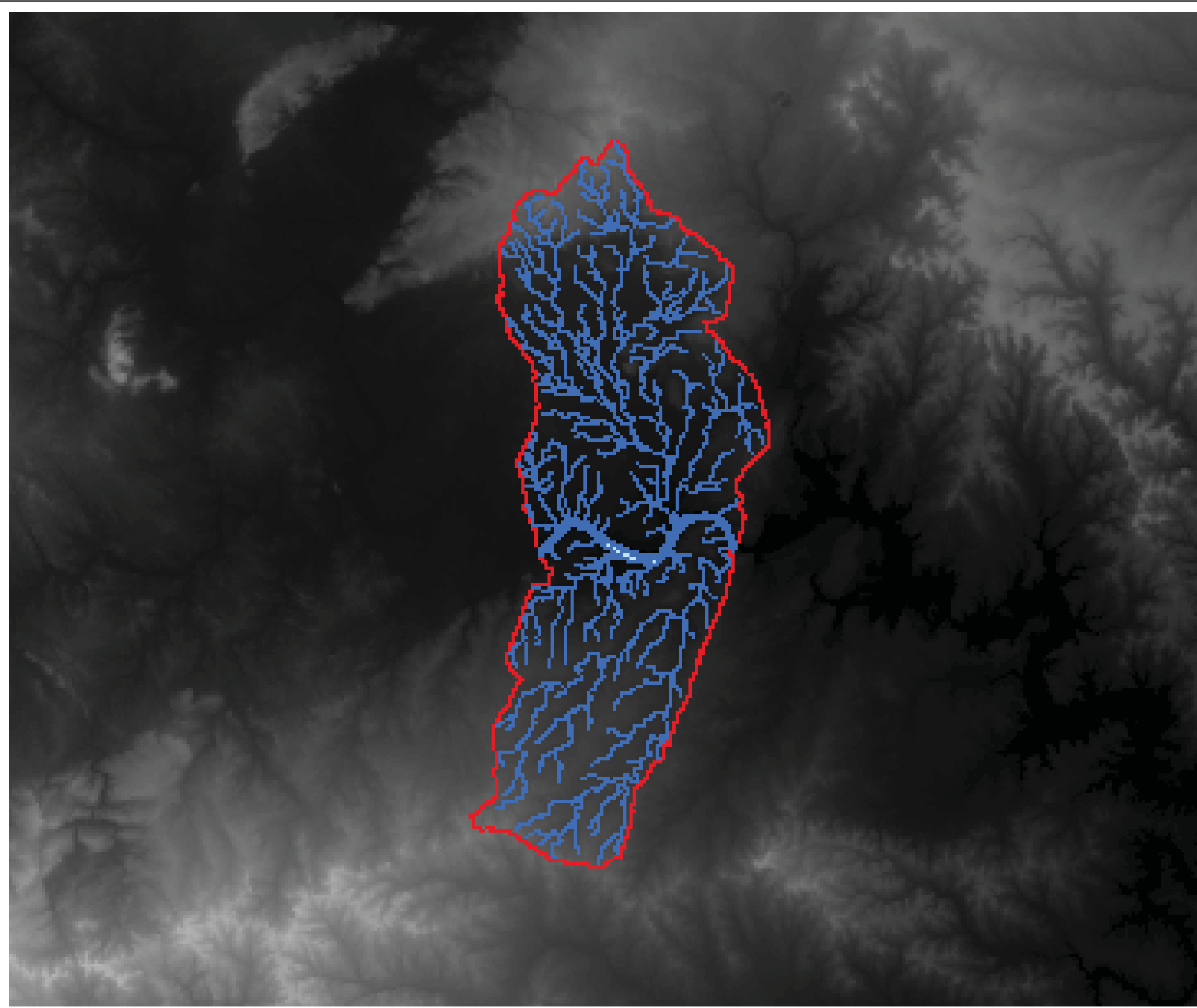
 30-32

Figure 3-23.

Lake Marble Falls Watershed
Average Annual Precipitation
and Meteorological Stations



October 2010



Legend

- Stream
- Lake Marble Falls Watershed
- Lake Marble Falls

Elevation (m above msl)

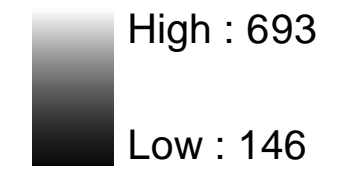
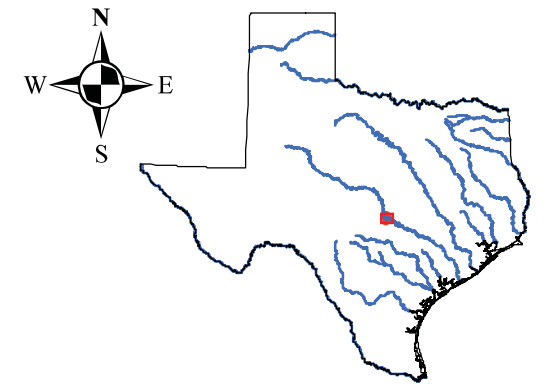
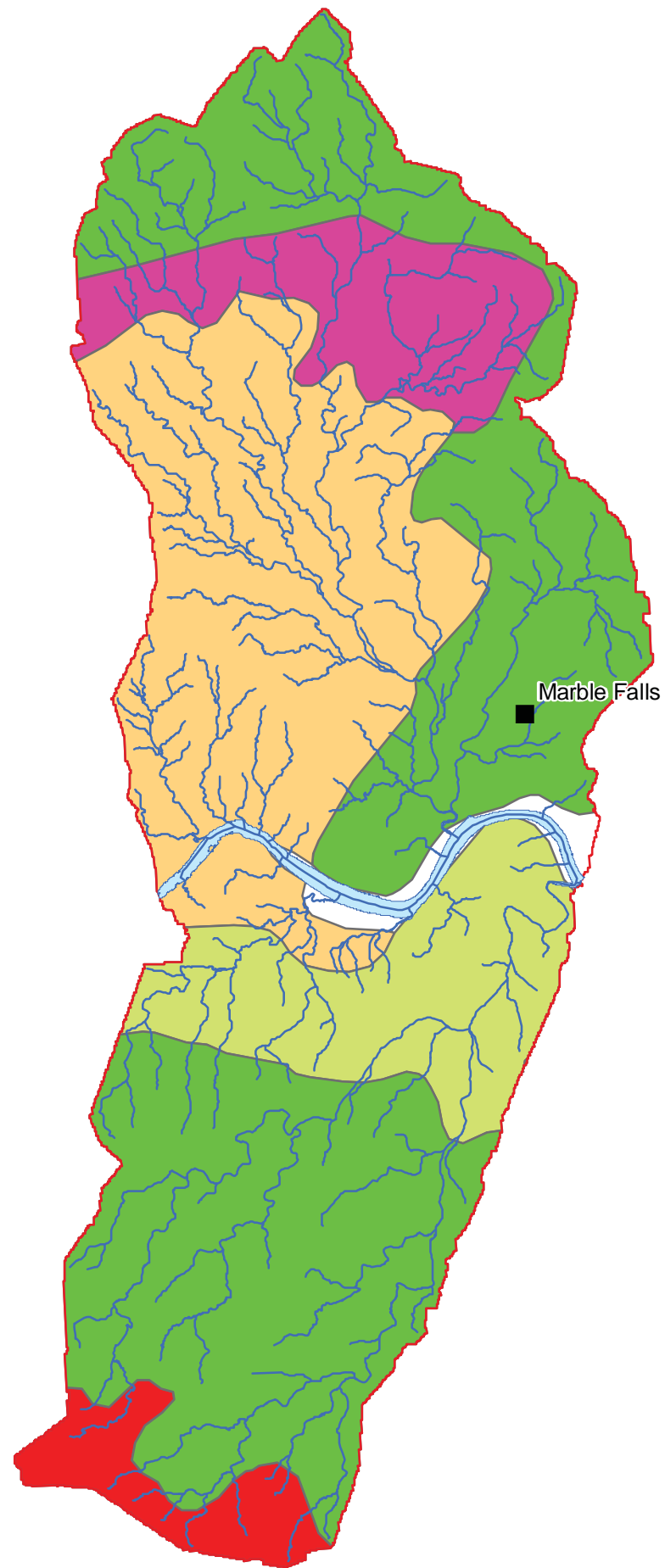


Figure 3-24.

Lake Marble Falls Watershed with Digital Elevation Model



November 2010



Legend

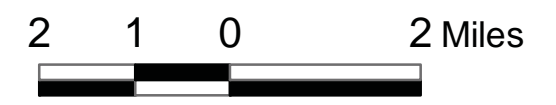
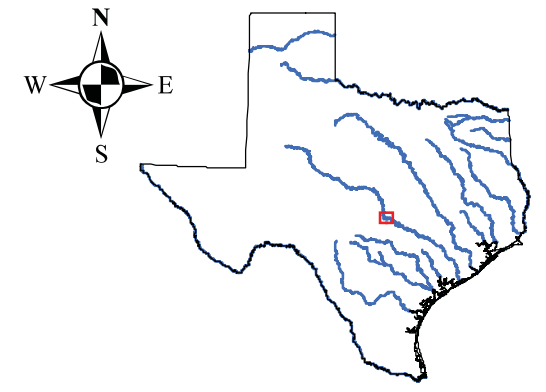
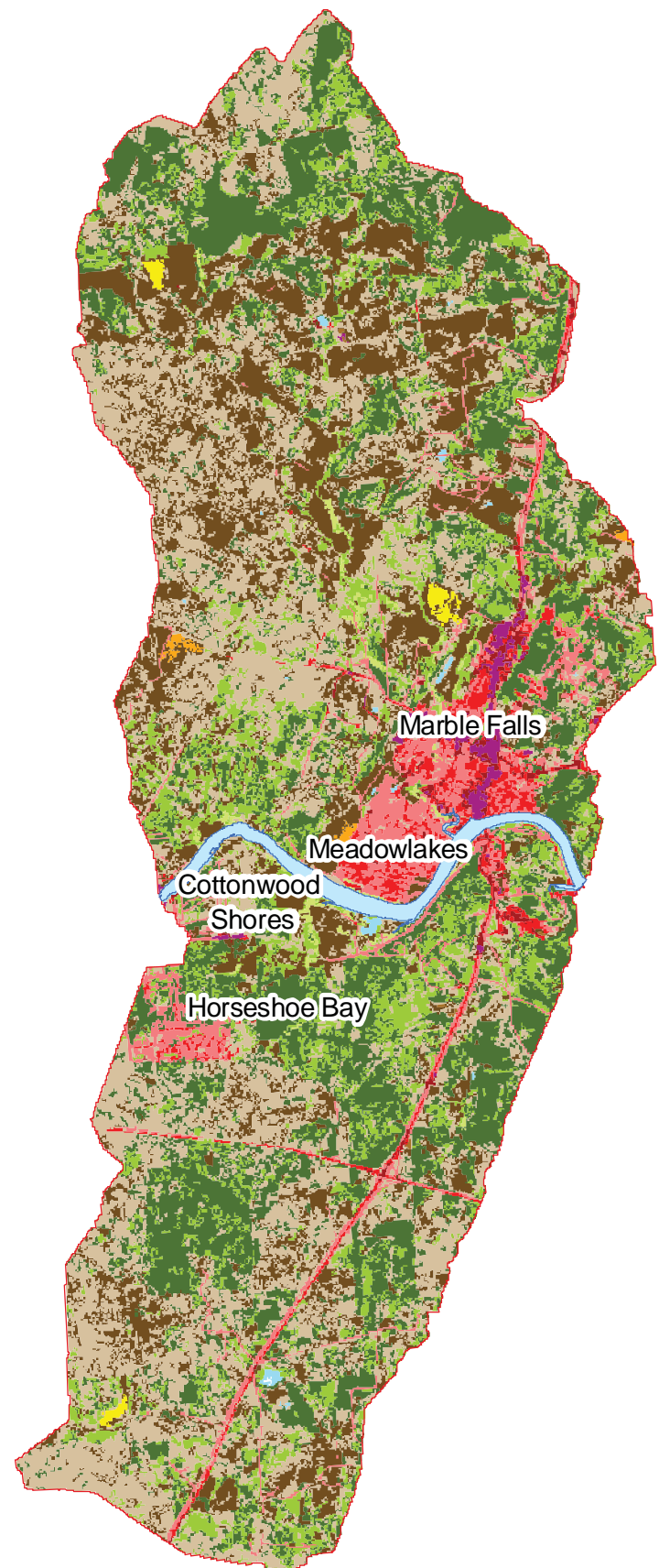
- Major Cities
- Stream
- Lake Marble Falls
- TX071
- TX155
- TX227
- TX360
- TX592

Figure 3-25.

Lake Marble Falls Watershed
STATSGO Classification



November 2010



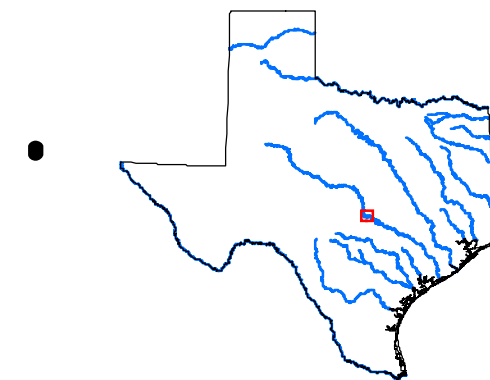
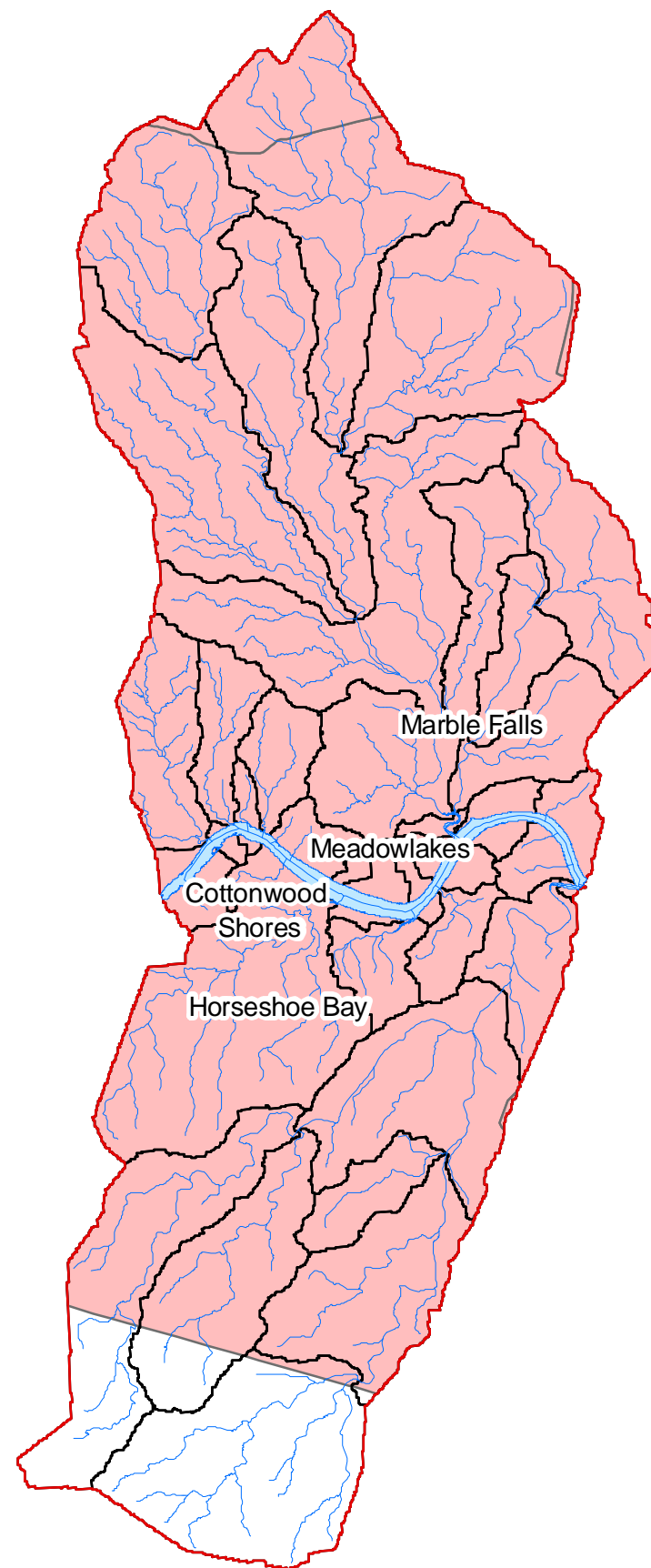
Legend

- Deciduous Forest
- Wetlands
- Evergreen Forest
- Mixed Forest
- Forested Wetlands
- Agricultural Land-Row Crop
- Hay
- Range - Brush
- Range - Grasses
- Range - Southwestern Arid
- Residential-Low Density
- Residential-Medium Density
- Residential-High Density
- Industrial
- Water

Figure 3-26.
 Lake Marble Falls Watershed
 Land Cover



November 2010



Legend



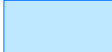
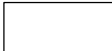

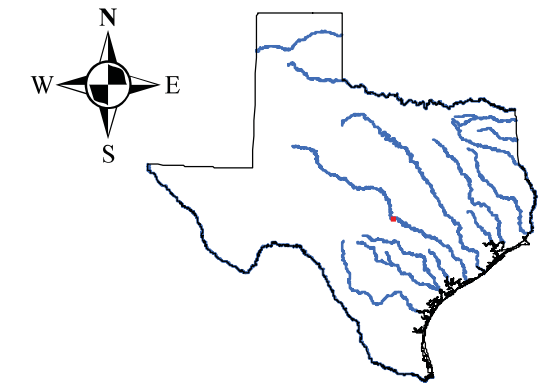
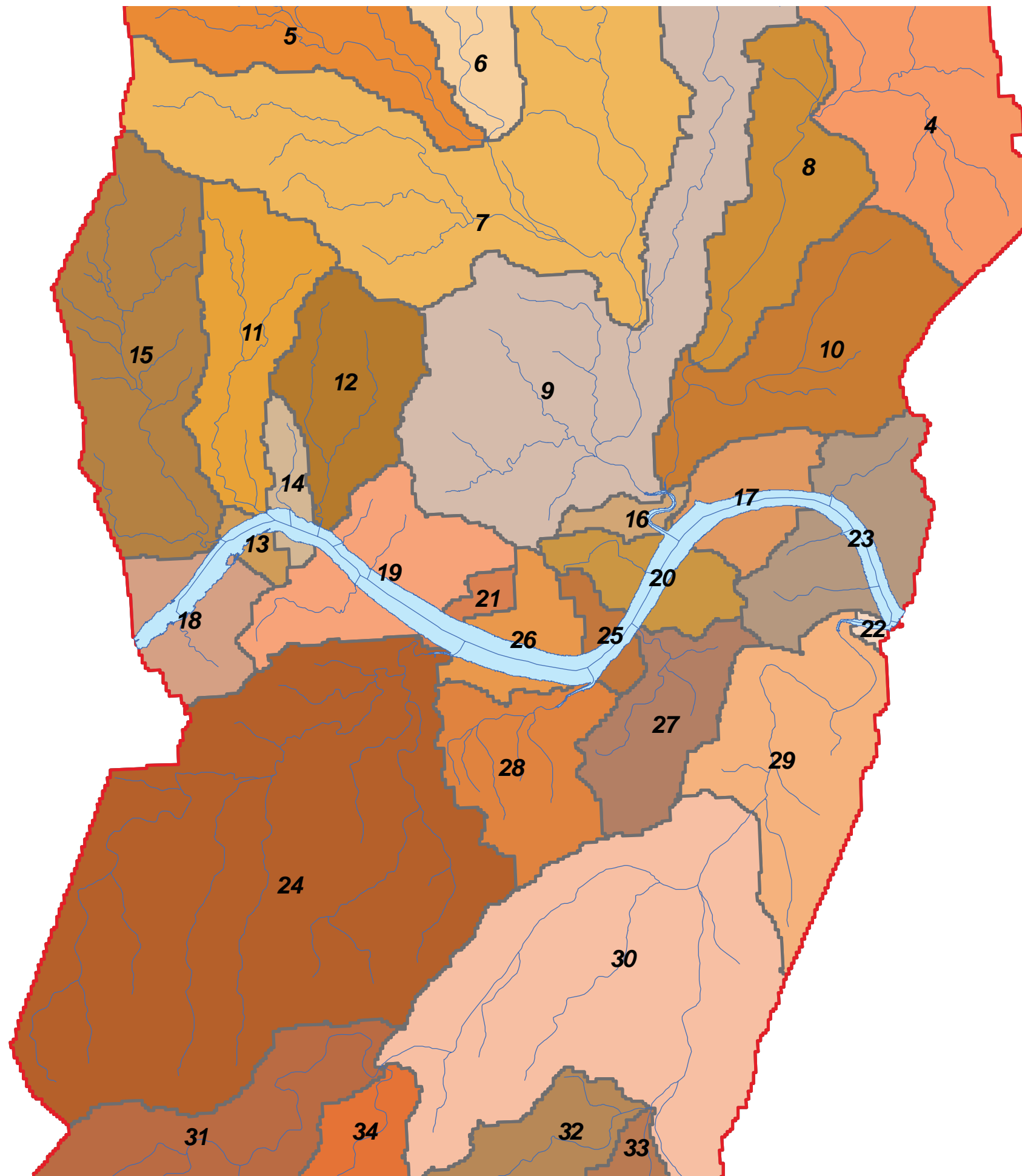
-  Stream
-  Lake Marble Falls Watershed
-  Lake Marble Falls
-  Lake Marble Falls Delineation
- Highland Lakes Watershed Ordinance**
-  Region B

Figure 3-27.

Extent of the HLWO within
Lake Marble Falls Watershed



November 2010



Legend



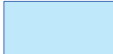

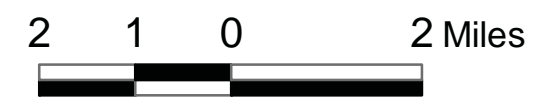
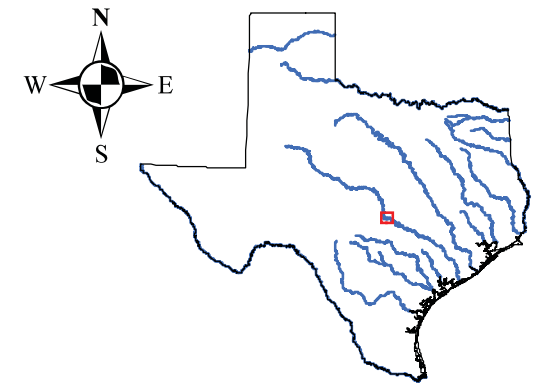
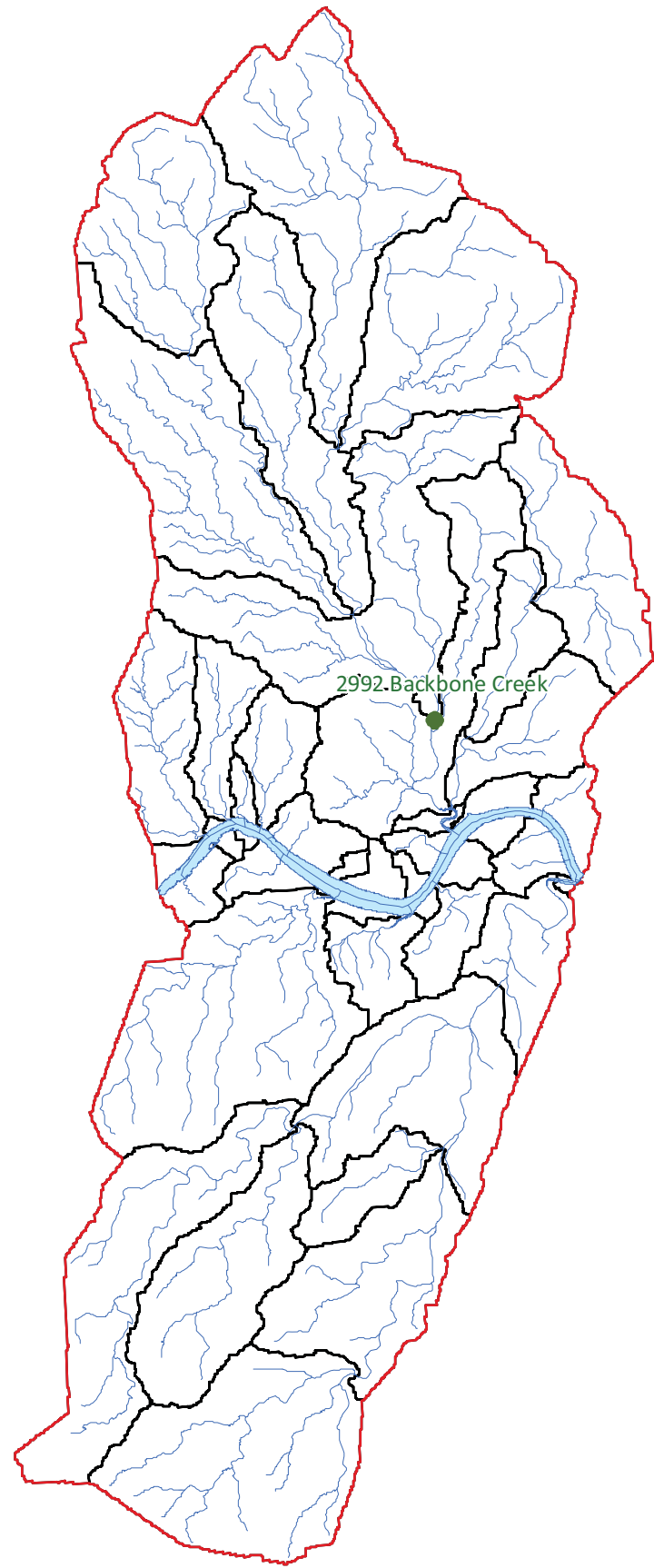
-  Stream
-  Lake Marble Falls Watershed
-  Lake Marble Falls
-  SWAT Model Subbasin

Figure 3-28.

Lake Marble Falls Watershed
Model Segmentation



November 2010



Legend

- LCRA Hydromet Station
- Stream
- Lake Marble Falls Watershed
- Lake Marble Falls
- Lake Marble Falls Delineation

Figure 3-29.
 Lake Marble Falls Sub-watershed
 Delineation with Calibration
 Stations



November 2010

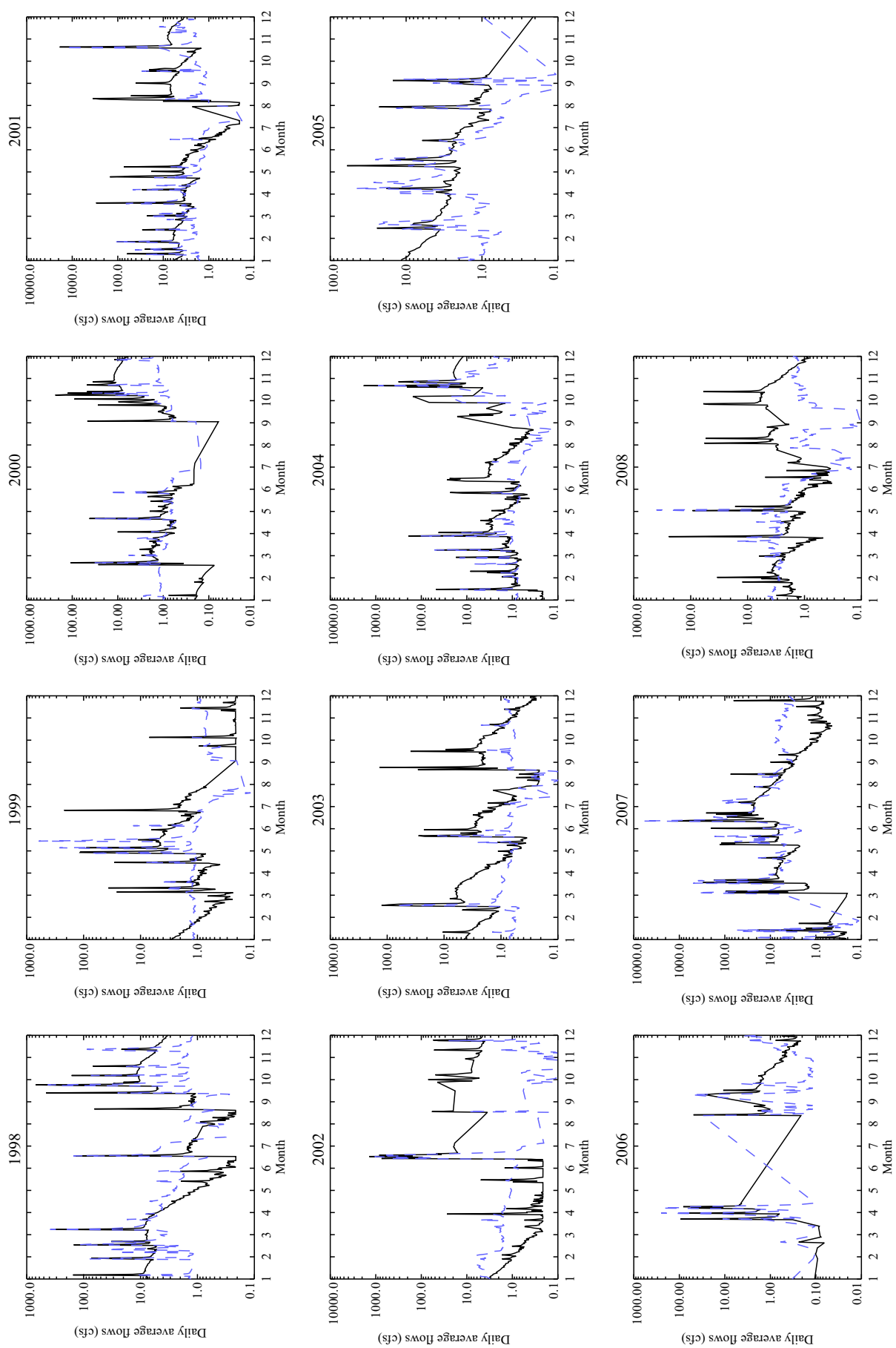
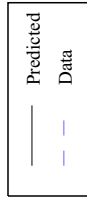


Figure 3-30.
SWAT modeled and reported daily flows for Backbone Creek (Reach 7) draining to LMF

Model run: basecase_mod_20090706.
R2 = 0.31; NS = -1.60

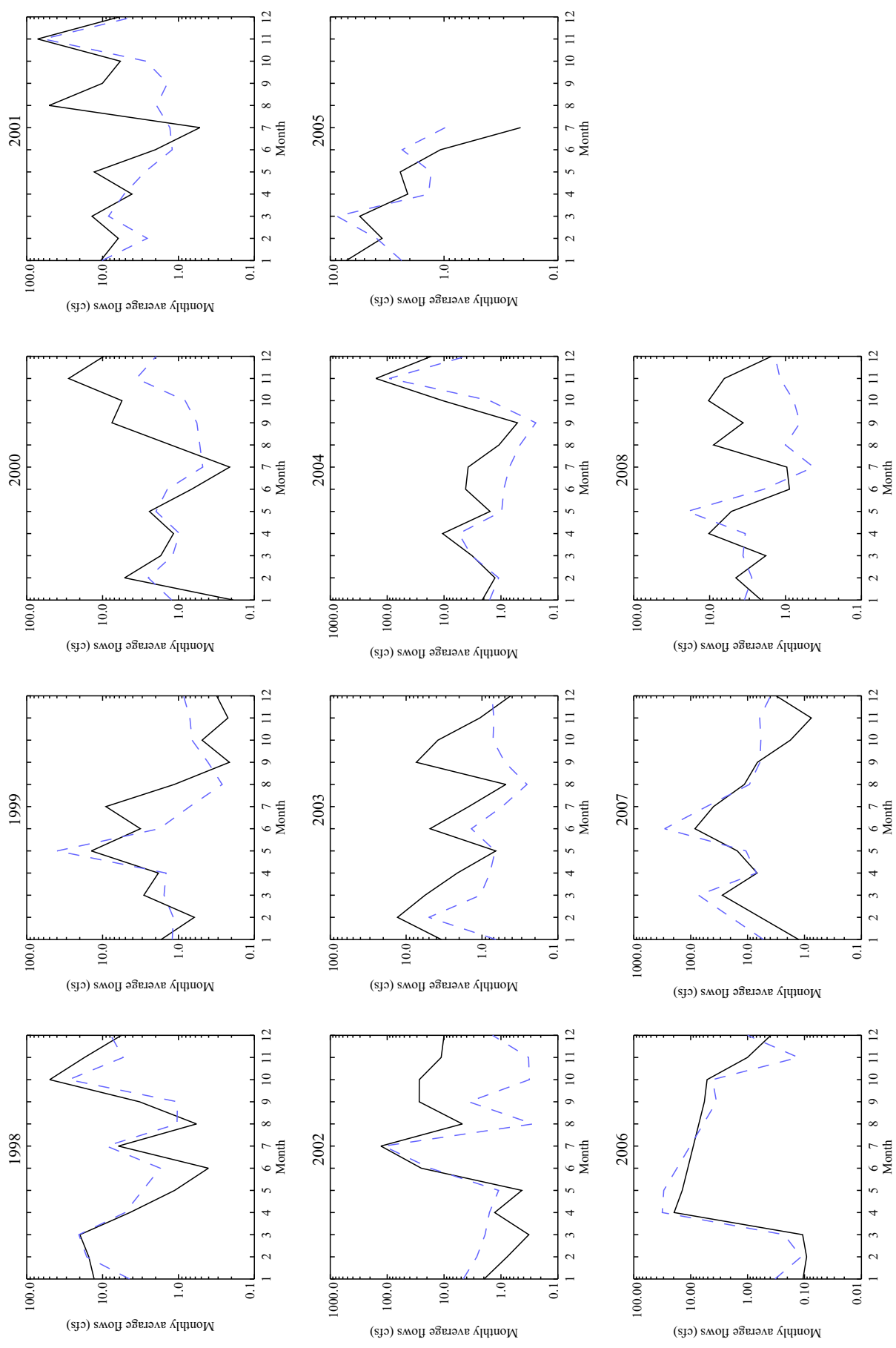
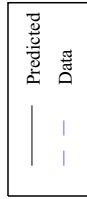


Figure 3-31a.
SWAT modeled and reported monthly average flows for Backbone Creek (Reach 7) draining to Lake LMF

Model run: basecase_mod_20090706.
R2 = 0.50; NS = 0.01;

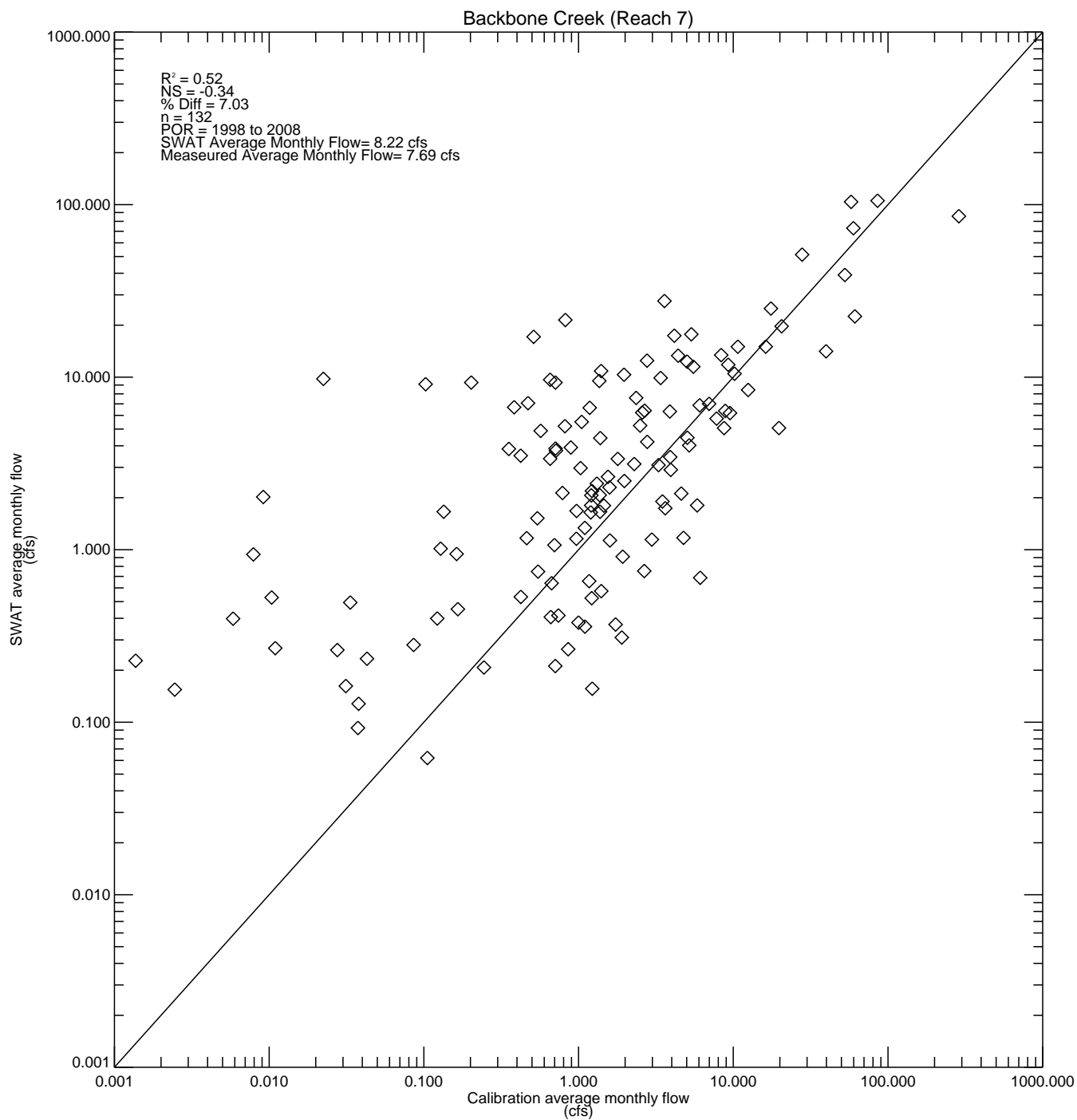


Figure 31b. SWAT modeled and reported monthly average flows for Backbone Creek to Lake LMF

Model run: 20100817c.

Calibration values are measured LCRA Hydromet flows.

Calibration values of 0 are plotted as 0.001.

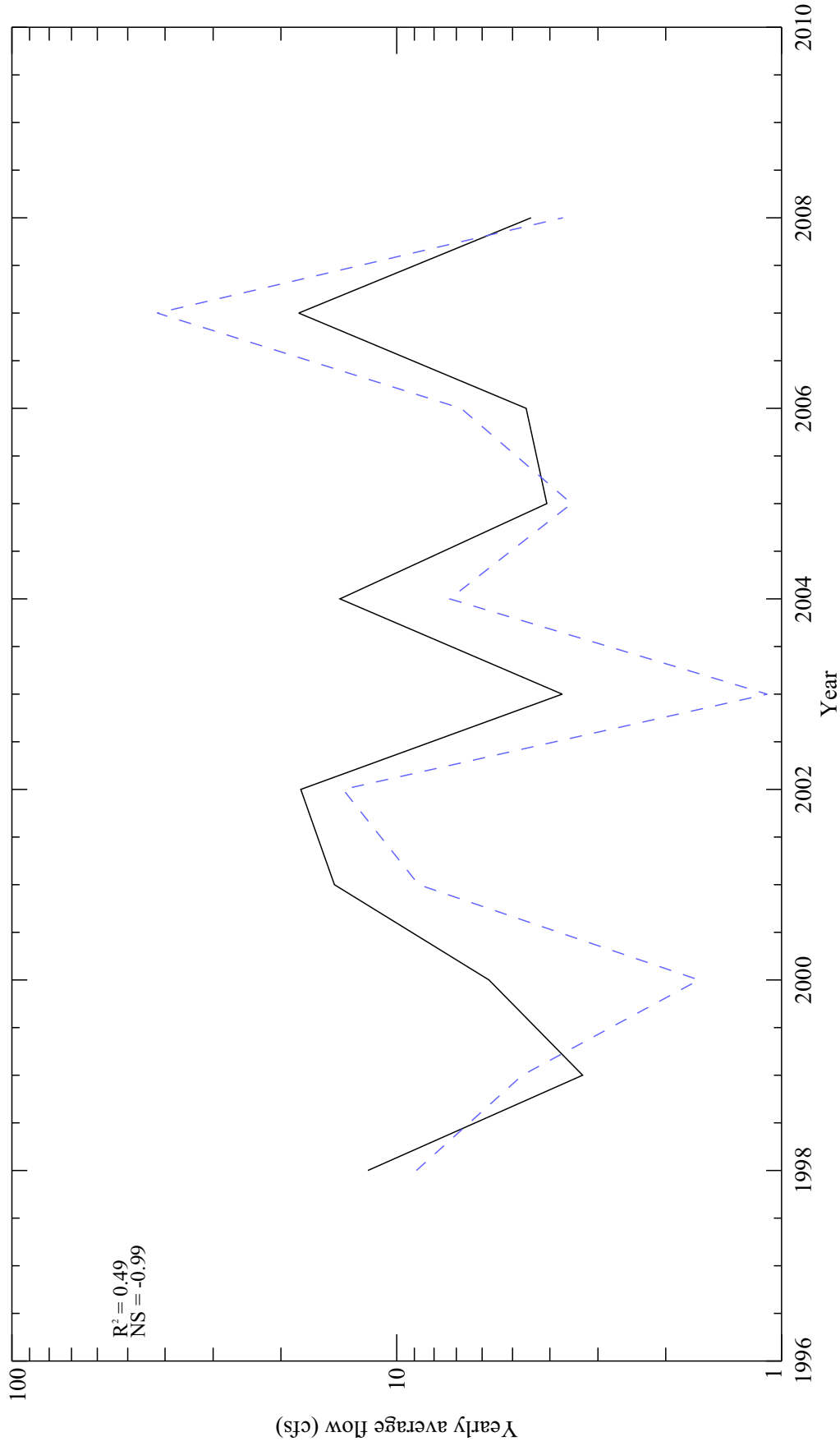
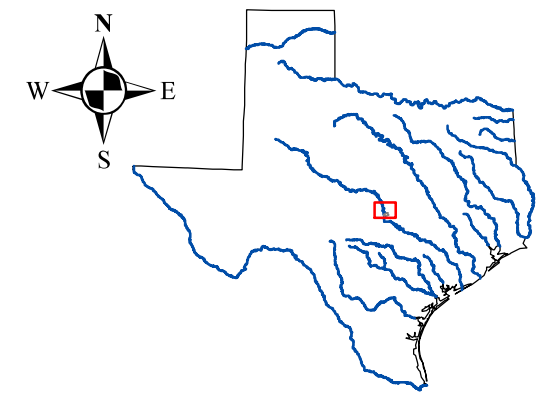
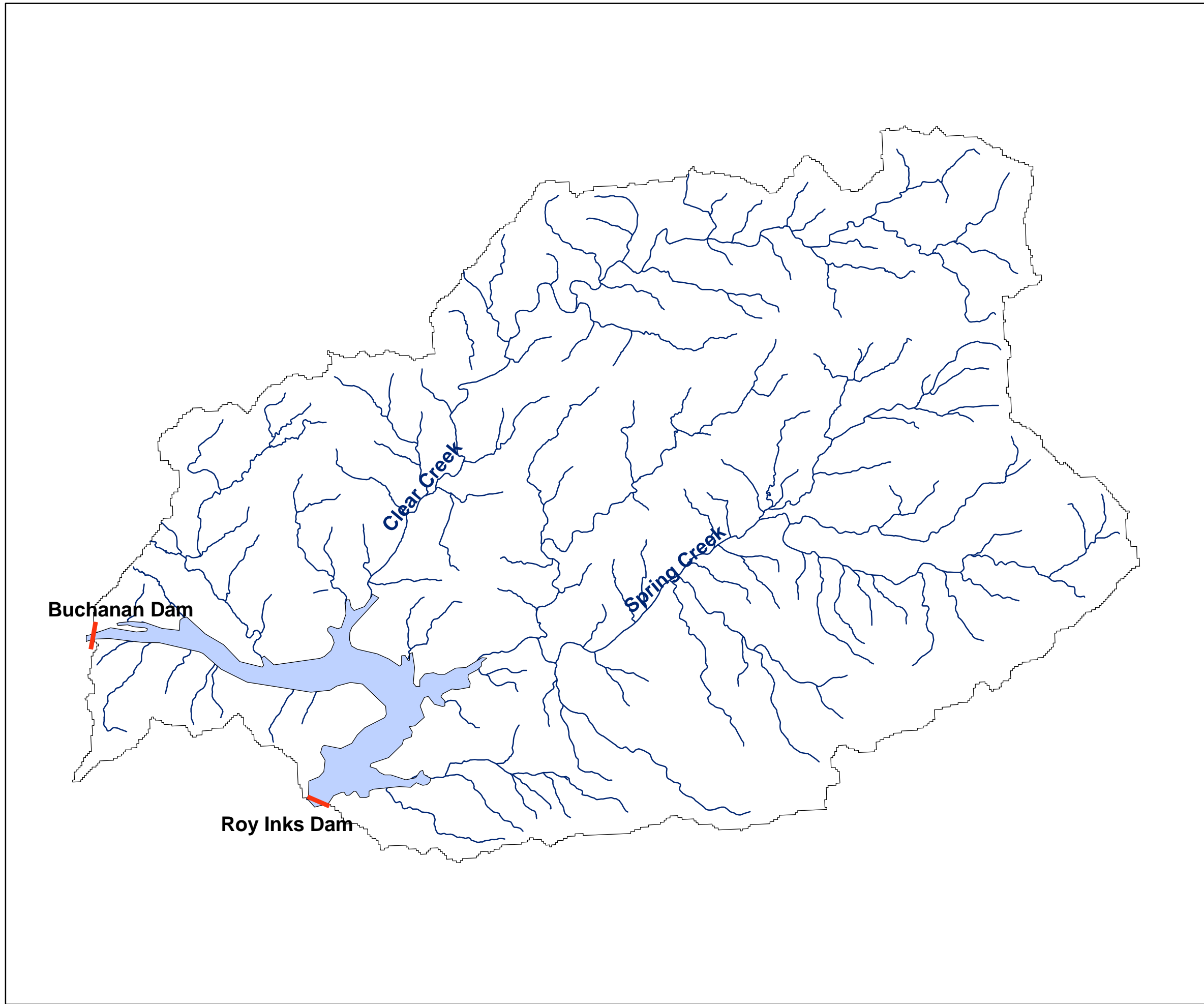


Figure 3-32.
SWAT modeled and reported yearly average flows for Backbone Creek (Reach 7) draining to Lake LMF

*Averages calculated from hourly values.
 Model run: basecase_mod_20090706.*







- Legend**
-  Dam
 -  Stream
 -  Inks Lake Watershed
 -  Inks Lake

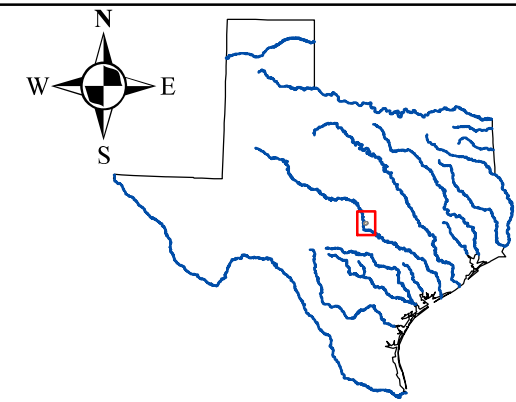
Figure 3-33.

Inks Lake Watershed
and Stream Network



November 2010

ROCK UNIT	SHORT NAME	PERIOD
Crc_LL	Lion Mountain, Cap Mountain	Cambrian
Crh_LL	Hickory	Cambrian
Cwm_LL	Morgan Creek, Welge	Cambrian
Cwp_LL	Point Peak	Cambrian
Cws_LL	San Saba	Cambrian
Kgru_LL	Glen Rose	Cretaceous
Kh_LL	Hensell	Cretaceous
Kwa_LL	Walnut	Cretaceous
Ot_LL	Tanyard	Ordovician
pCh_LL	Honey	Precambrian
pCps_LL	Packsaddle	Precambrian
pCtm_LL	Town Mountain	Precambrian
pCvs_LL	Valley Spring	Precambrian
Wa_LL	Water	-



Legend

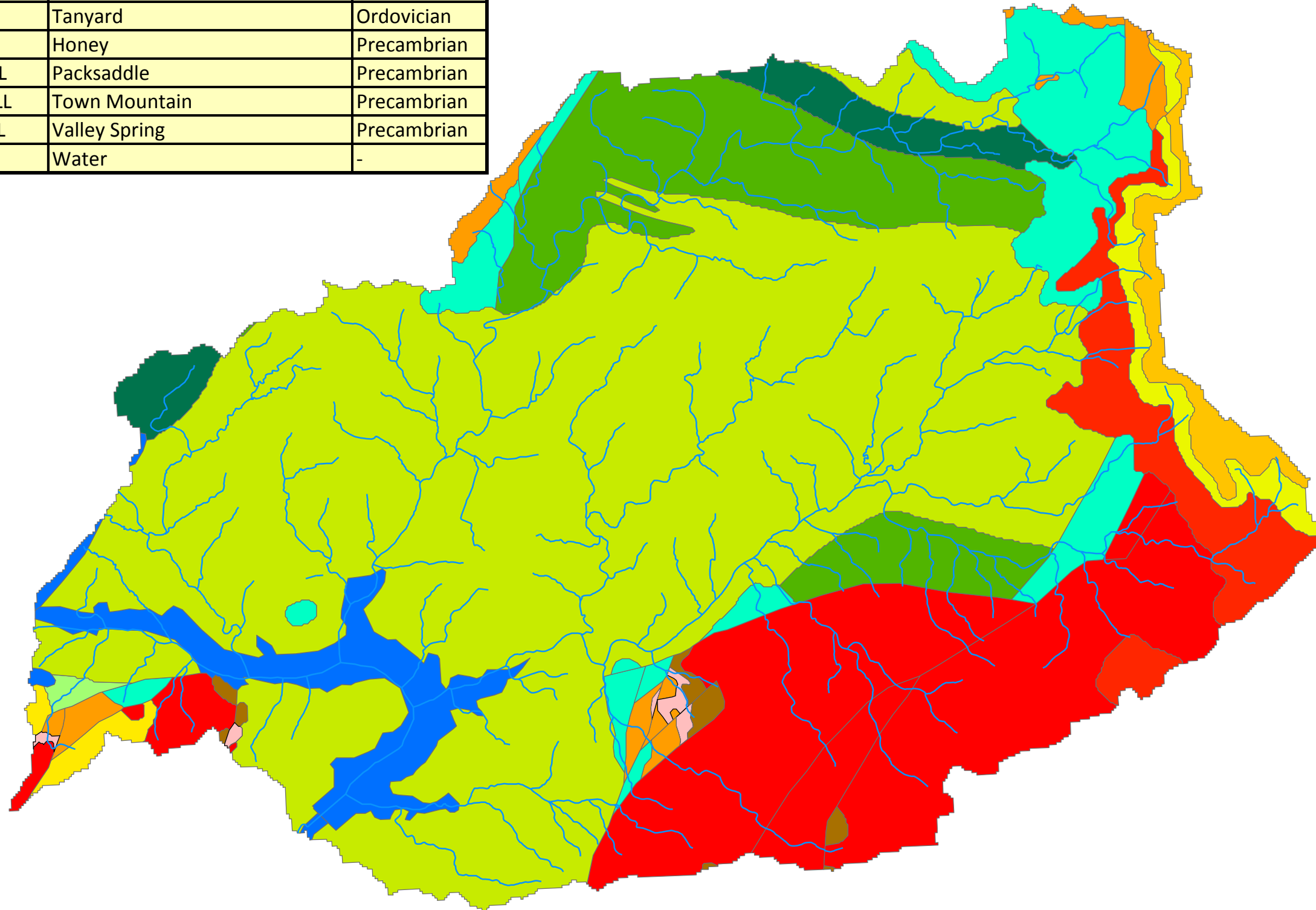
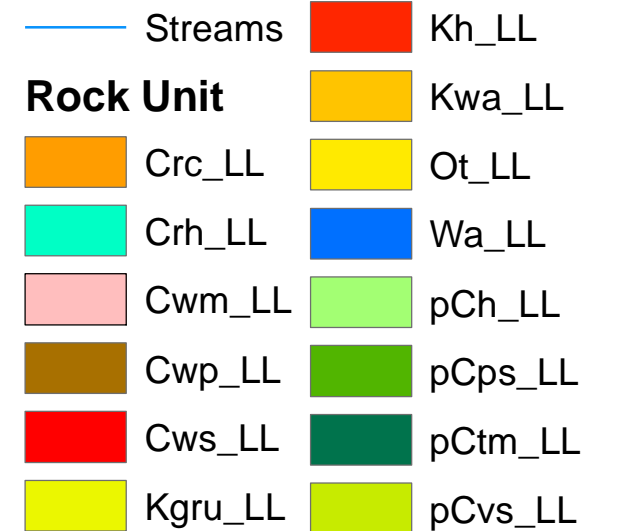


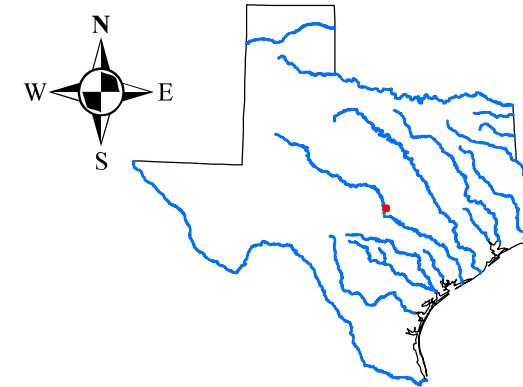
Figure 3-34.

Inks Lake Watershed
Geologic Regions



November 2010

Tow



Legend

- Precipitation gage
- Temperature gage

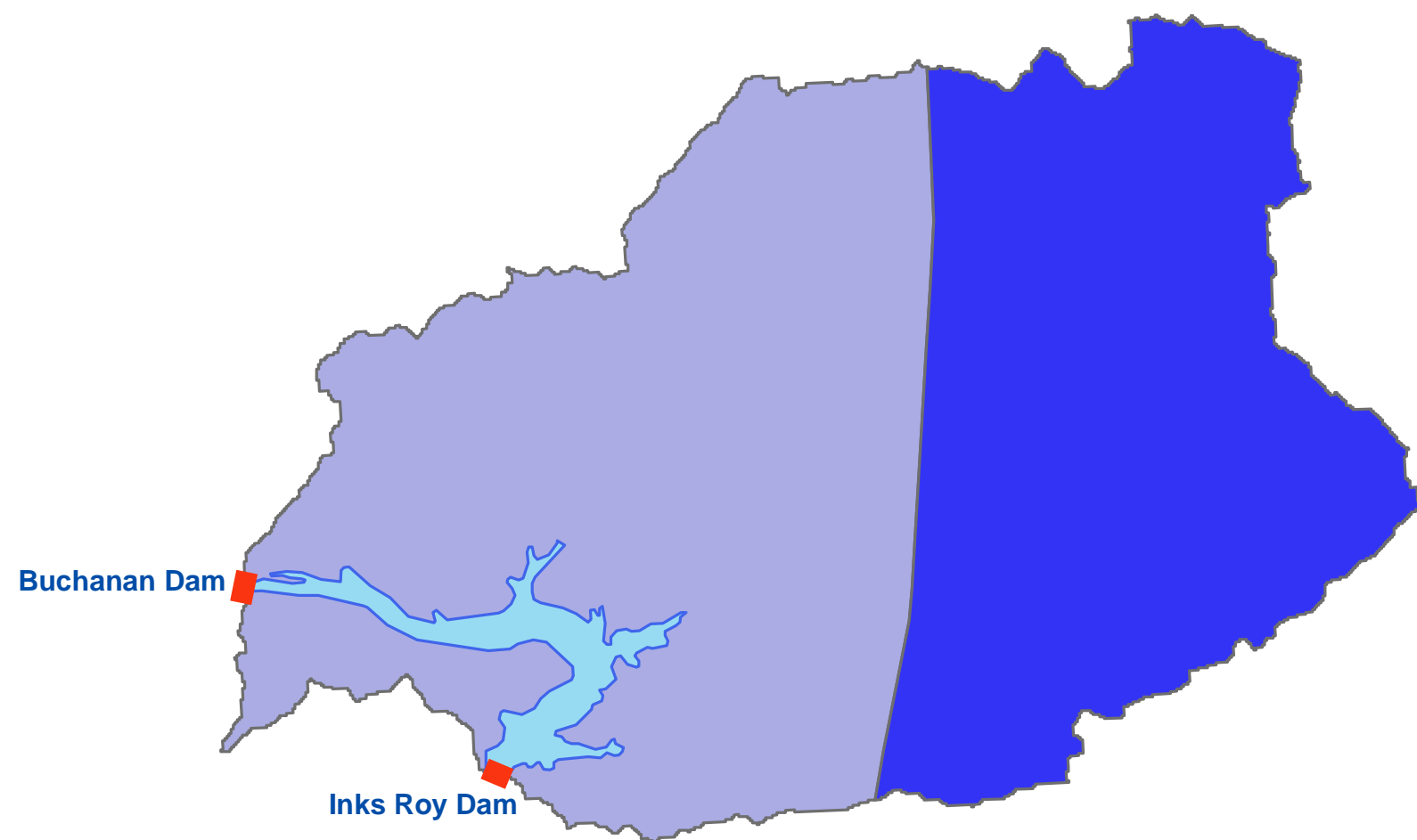
Dam

Inks Lake

Precipitation (inches)

28-30

30-32



Burnet

Figure 3-35.

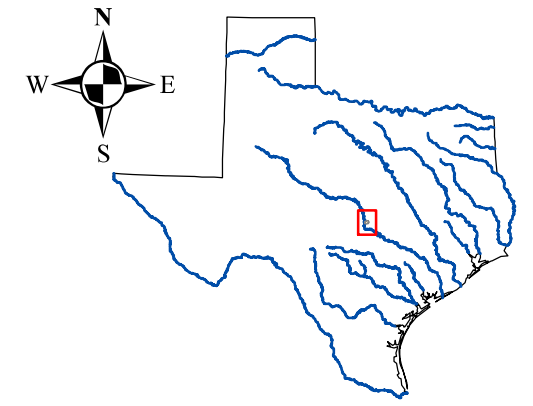
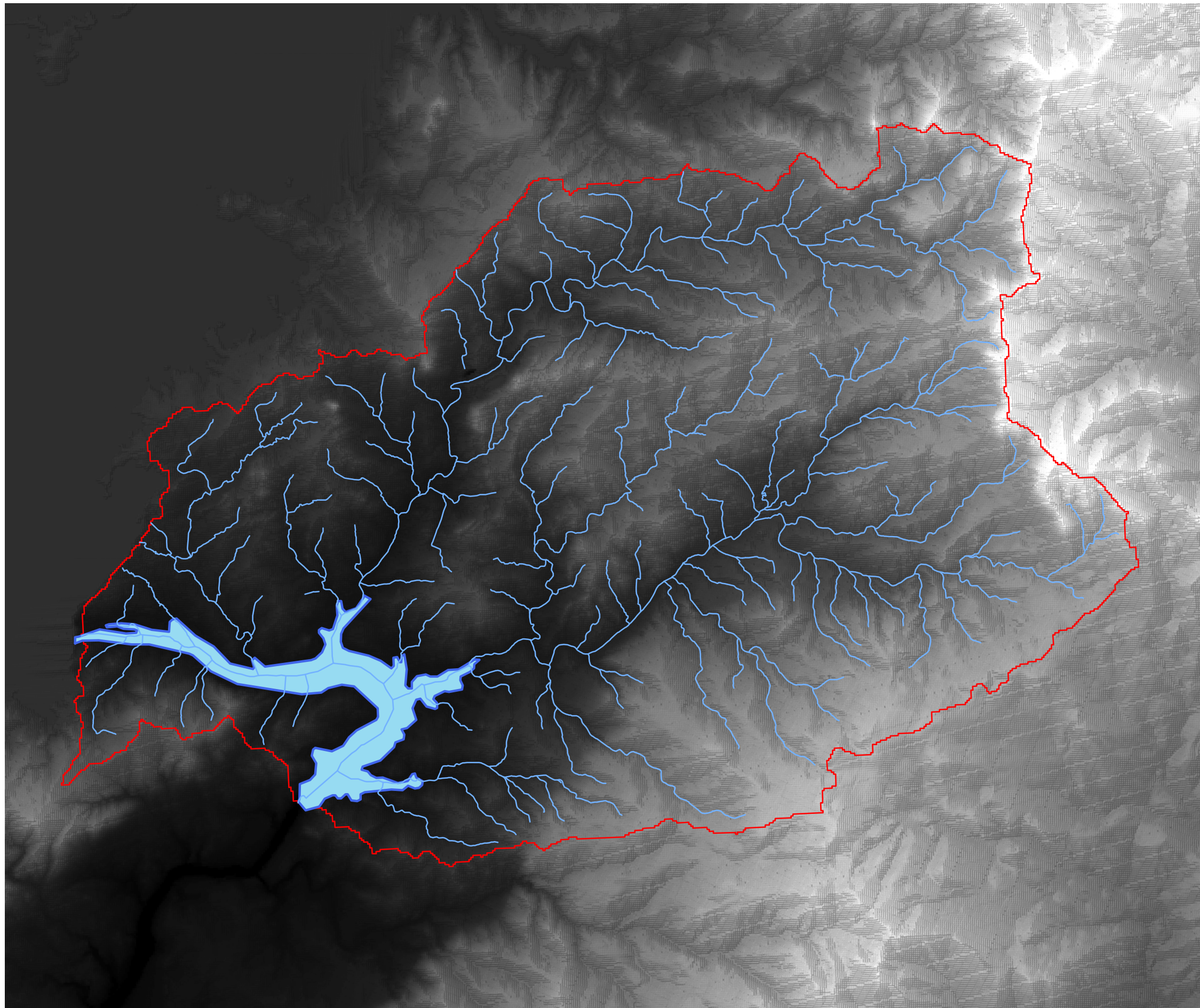
Inks Lake Watershed
Average Annual Precipitation
and Meteorological Stations



PARSONS



February 2011



Legend






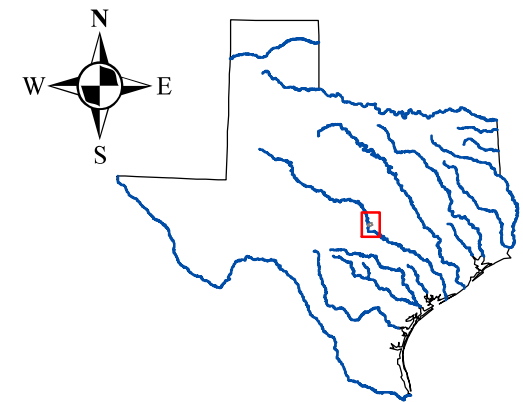
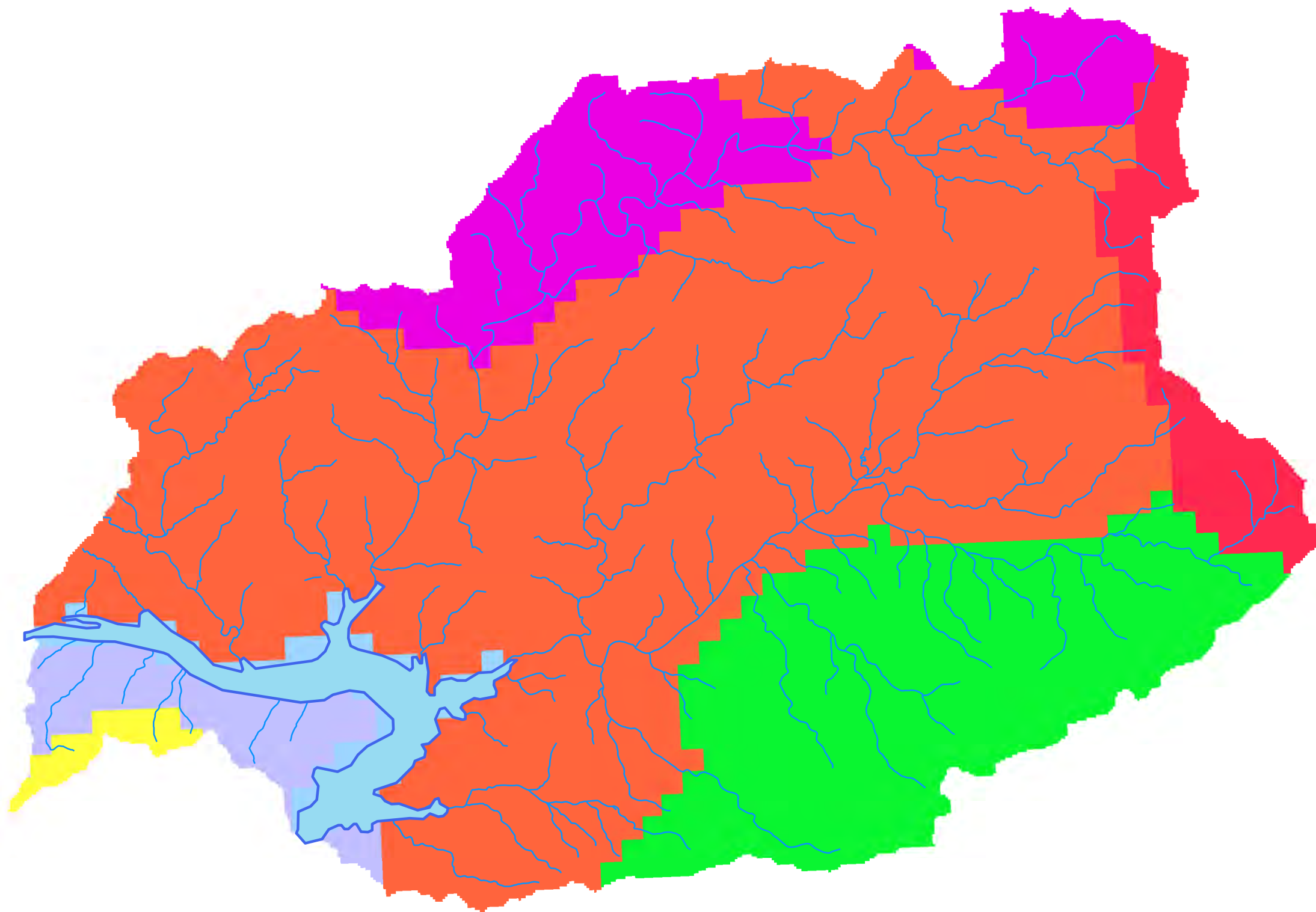
-  Stream
 -  Inks Lake
 -  Inks Lake Watershed
- Elevation (m above msl)
-  High : 631.782
 -  Low : 206.546

Figure 3-36.

Inks Lake Watershed
with Digital Elevation Model





Legend










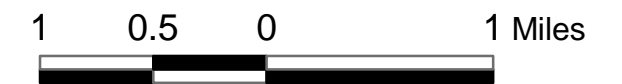
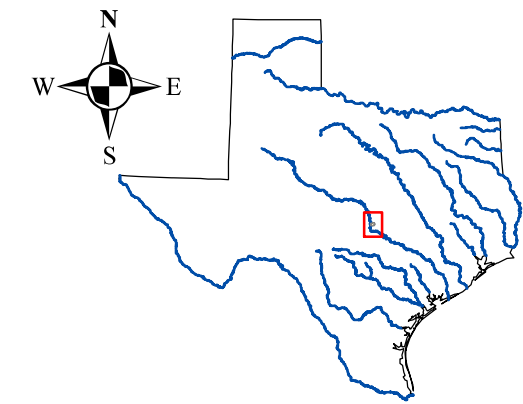
-  Stream
-  Inks Lake
-  TX071
-  TX089
-  TX151
-  TX227
-  TX360
-  TX592
-  TXW

Figure 3-37.

Inks Lake Watershed
STATSGO Soil Classification



November 2010



Legend










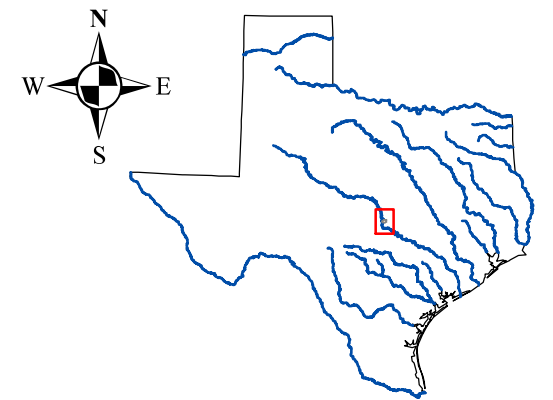
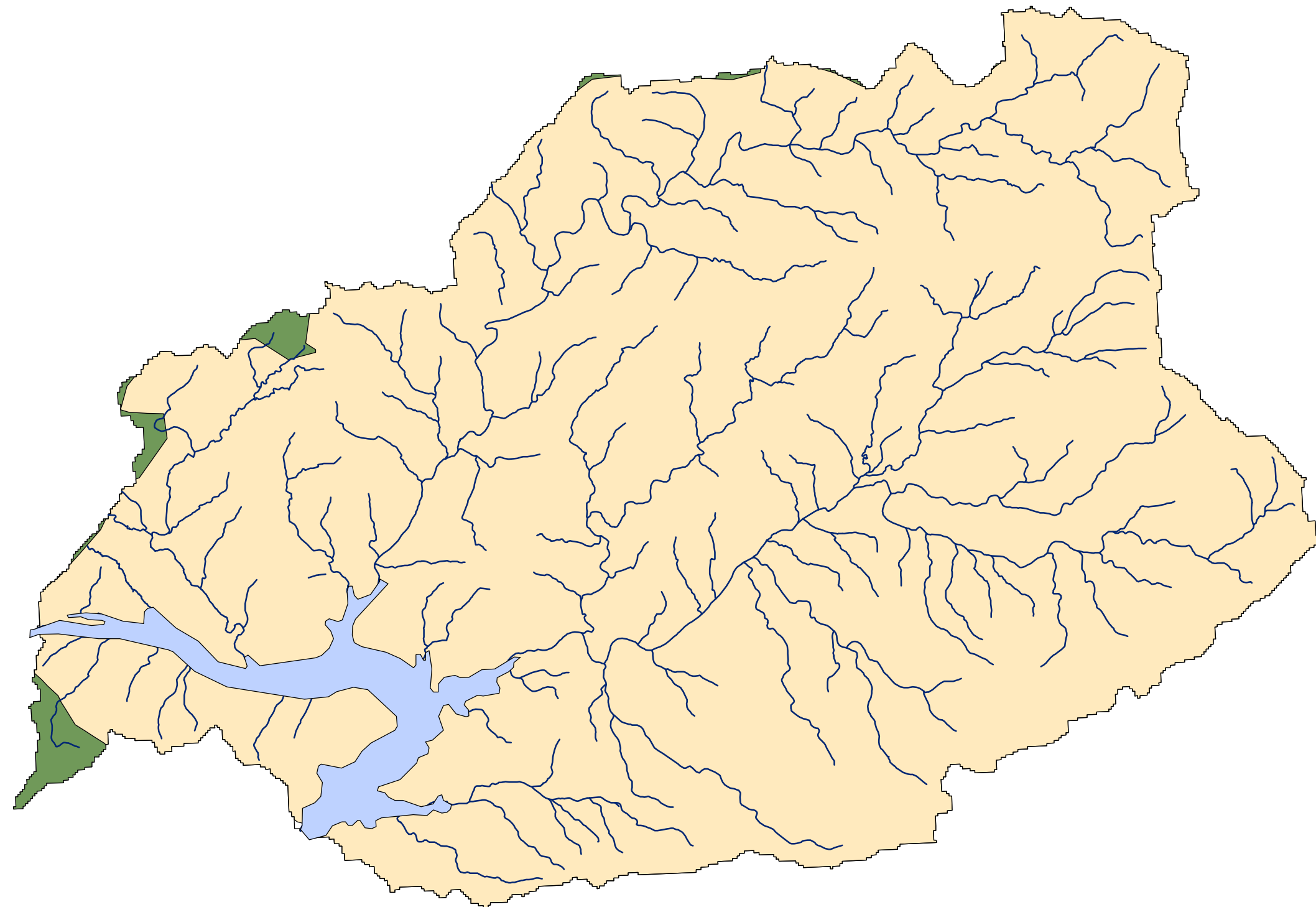
-  Forested Wetlands
-  Range-Grasses
-  Range-Brush
-  Evergreen Forest
-  Deciduous Forest
-  Residential-High Density
-  Residential-Medium Density
-  Residential-Low Density
-  Residential-Open Space
-  Water

Figure 3-38.




Inks Lake Watershed
NLCD Land Cover



November 2010



Legend

-  Inks Lake
-  Stream
-  Inks Lake Watershed

Highland Lakes Watershed Ordinance

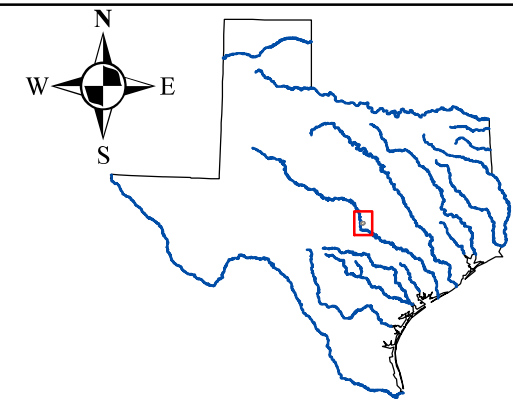
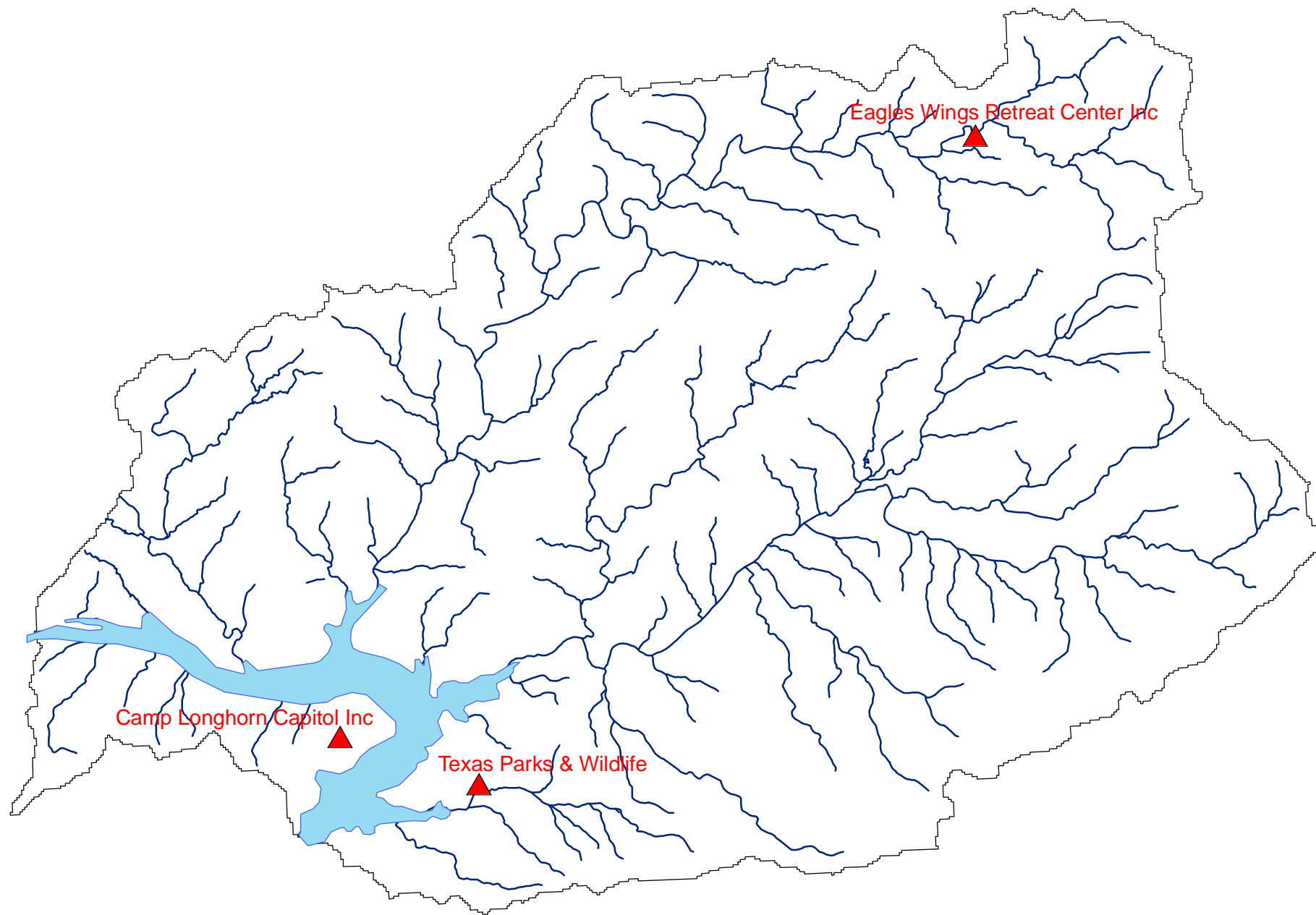
-  Region A
-  Region C

Figure 3-39.






Inks Lake Watershed
within the HLWO



November 2010



Legend

-  Permitted Discharger
-  City
-  Stream
-  Inks Lake
-  Inks Lake Watershed


Burnet 

Figure 3-40.

Inks Lake Watershed
Permitted Dischargers

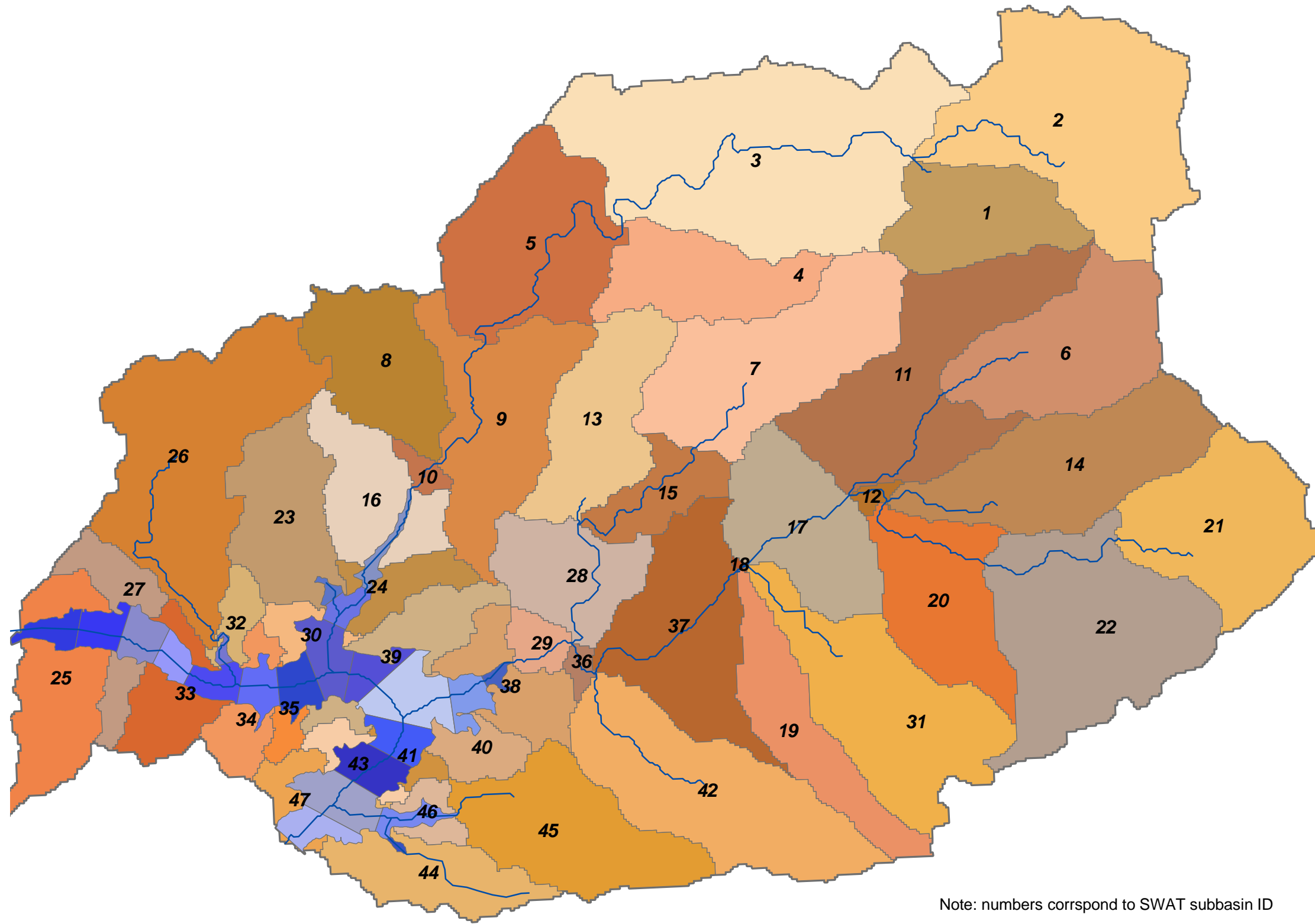
Note: The three permitted dischargers are land application permits.



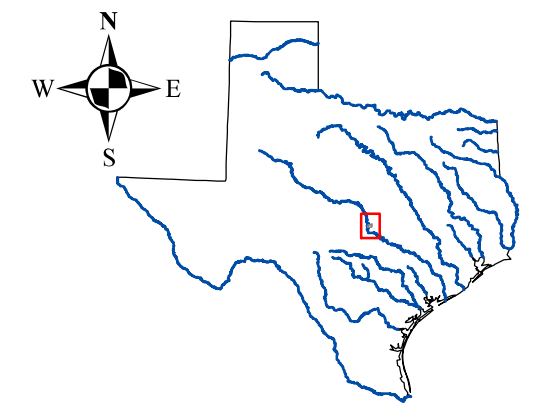
PARSONS



November 2010



Note: numbers correspond to SWAT subbasin ID






- Legend**
-  Surface water
 -  Lake Model Segment
 -  SWAT Model Subbasin

Figure 3-41.

Inks Lake Watershed
Model Segmentation



November 2010

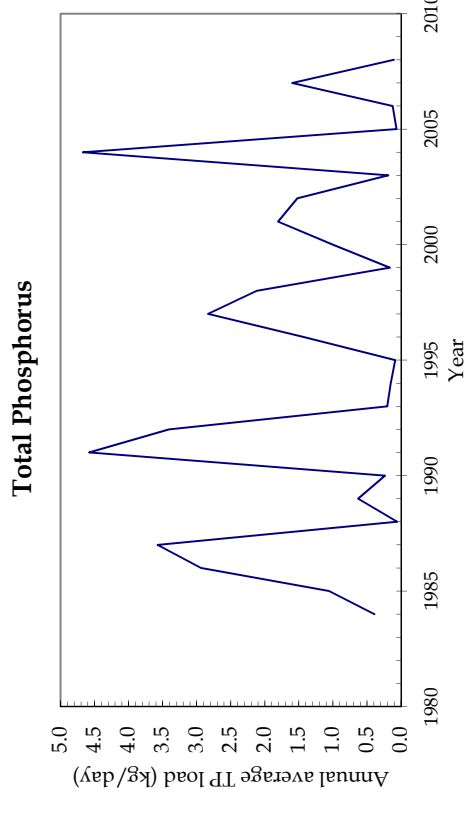
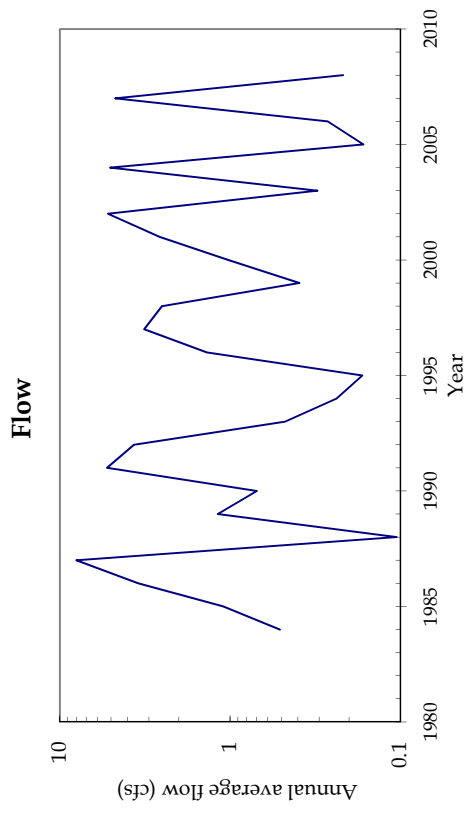
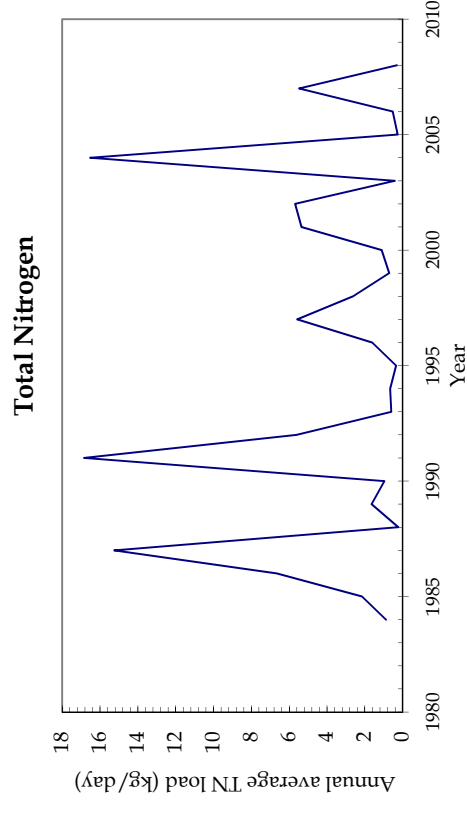
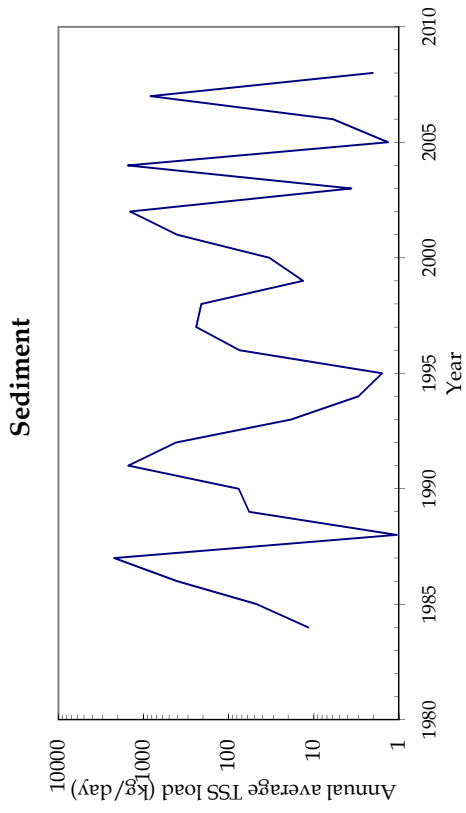


Figure 3-42. Inks Lake SWAT model annual average flows and loads for Spring Creek (Reach 29)

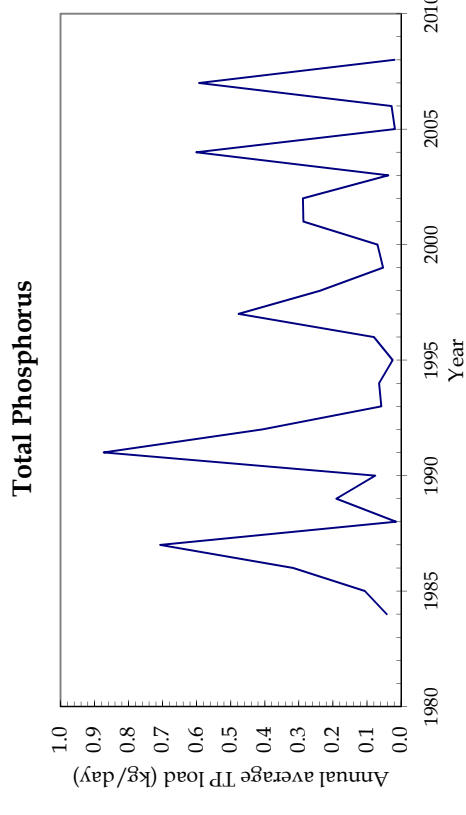
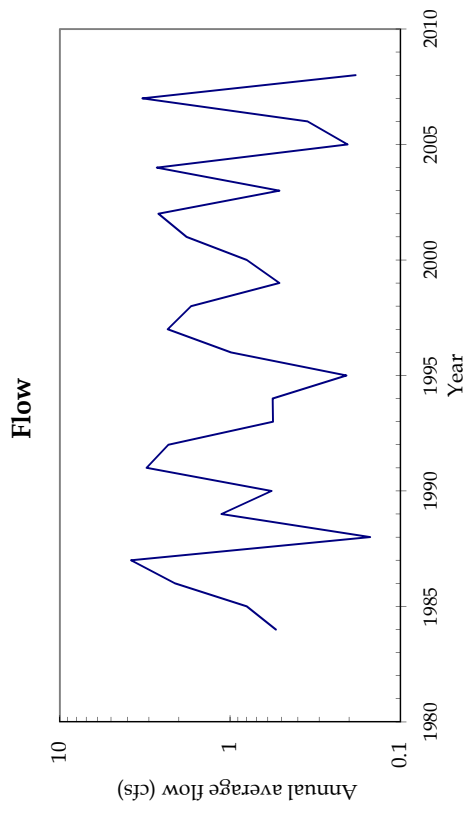
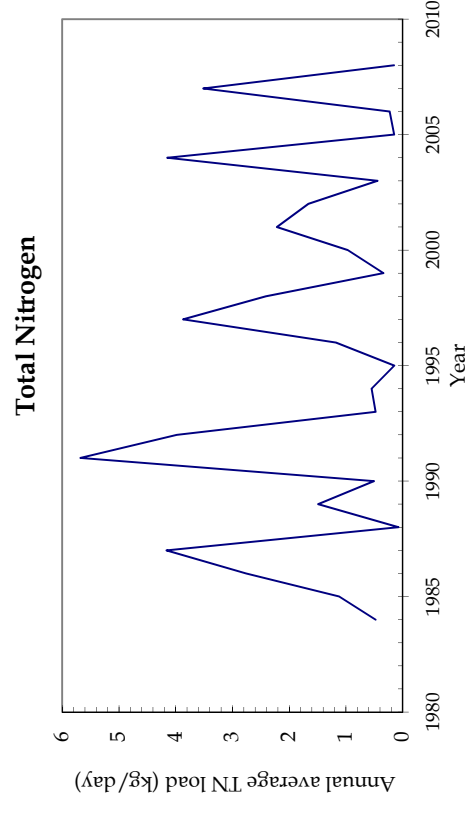
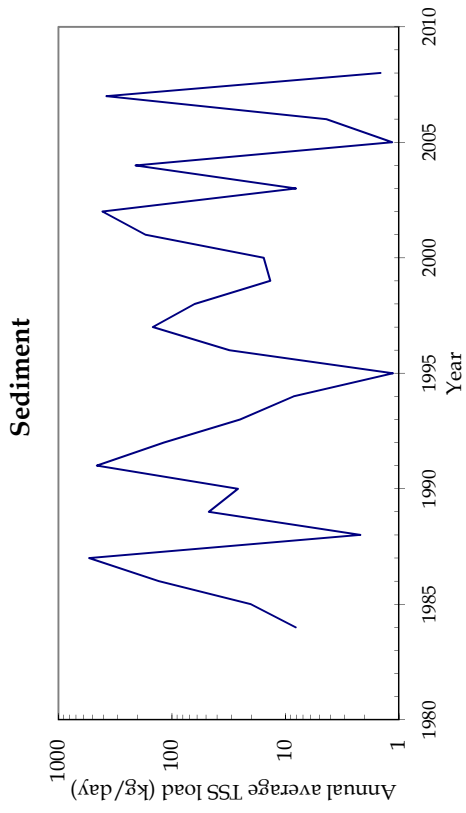


Figure 3-43. Inks Lake SWAT model annual average flows and loads for Clear Creek (Reach 10)