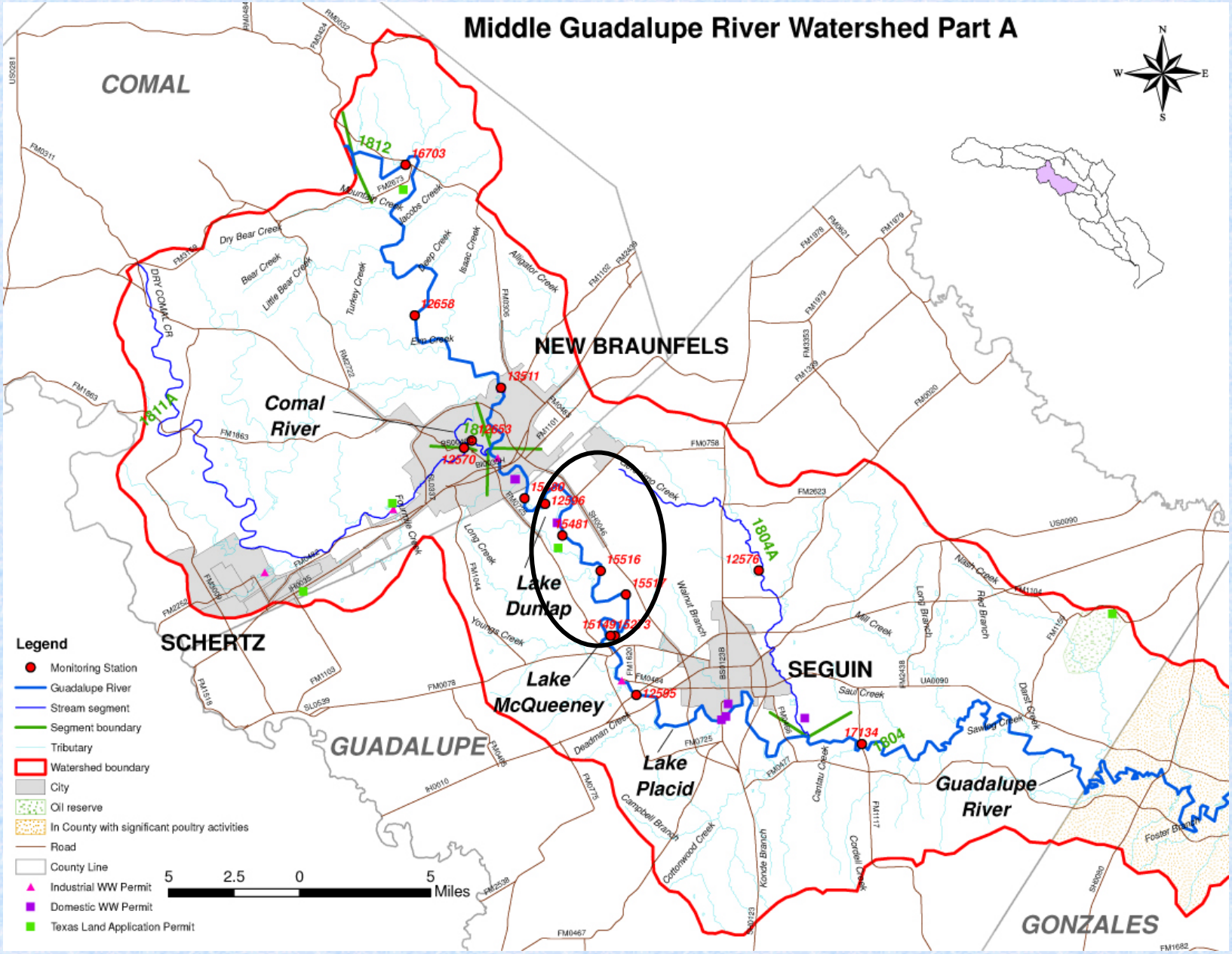
Special Nutrient Monitoring Study on Lakes Dunlap and McQueeney


Middle Guadalupe River Watershed Part A
COMAL
NEW BRAUNFELS
SCHERTZ
SEGUIN
GUADALUPE
GONZALES
Comal River
Lake Dunlap
Lake McQueeney
Lake Placid
Guadalupe River
1812
1811A
1804A
1804
16703
12658
13511
12653
12570
15481
15516
12576
12595
17134
Legend
Monitoring Station
Guadalupe River
Stream segment
Segment boundary
Tributary
Watershed boundary
City
Oil reserve
In County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
Texas Land Application Permit
5 2.5 0 5 Miles

Nutrient Study on Lakes Dunlap and McQueeney

- Characterize water quality conditions in the two impoundments

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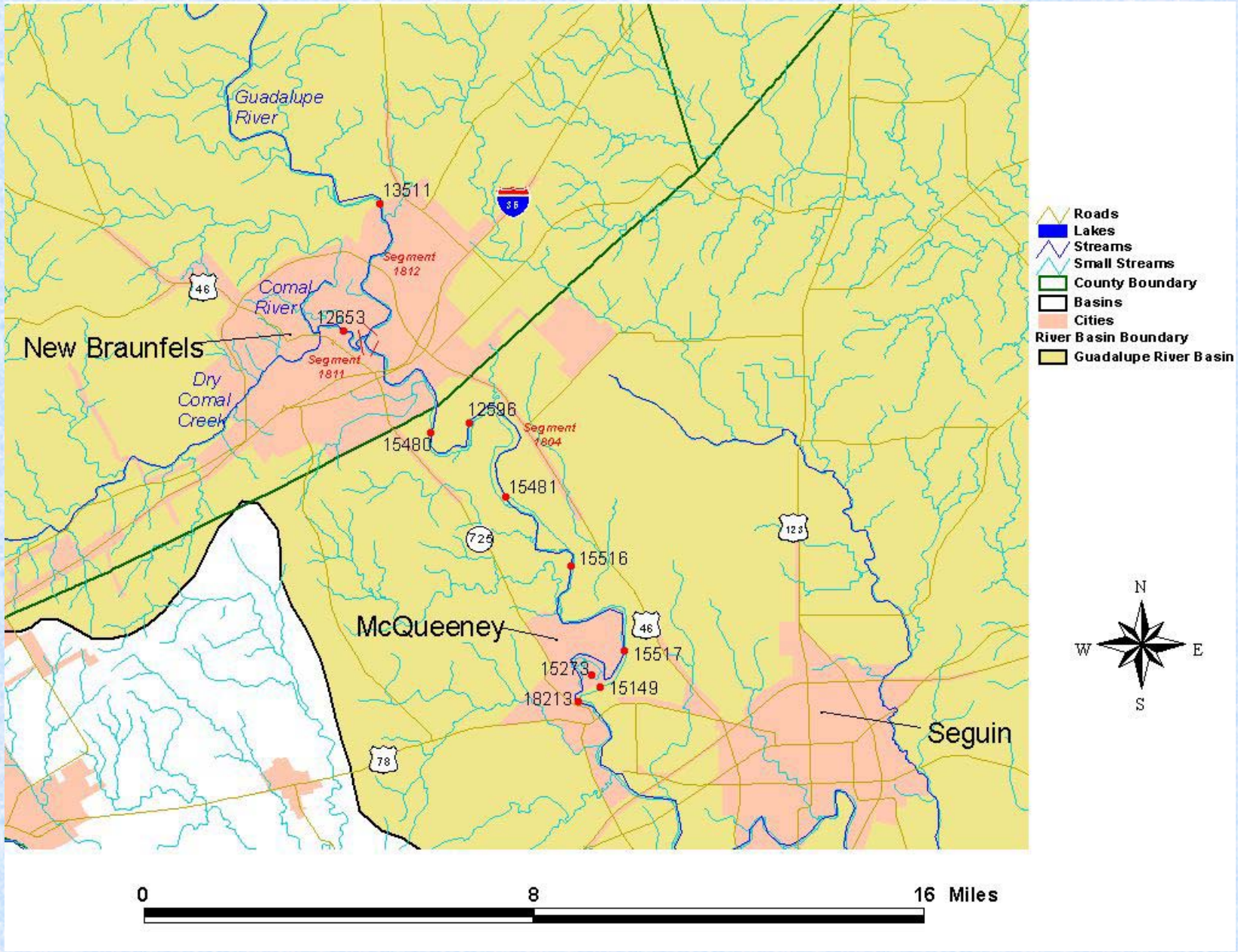
Nutrient Study on Lakes Dunlap and McQueeney

- Characterize water quality conditions in the two impoundments
- Look for possible nutrient sources
- Determine if a spatial relationship exists as water moves downstream
- Determine if relationship between flow and chlorophyll a seen in the historical data also seen during the study


Guadalupe River
13511
Segment 1812
Comal River
12653
New Braunfels
Segment 1811
Dry Comal Creek
12596
Segment 1804
15480
15481
15516
McQueeney
15517
15273
15149
18213
Seguin
Roads
Lakes
Streams
Small Streams
County Boundary
Basins
Cities
River Basin Boundary
Guadalupe River Basin
N
W
E
S
0
8
16 Miles

Nutrient Study on Lakes Dunlap and McQueeney

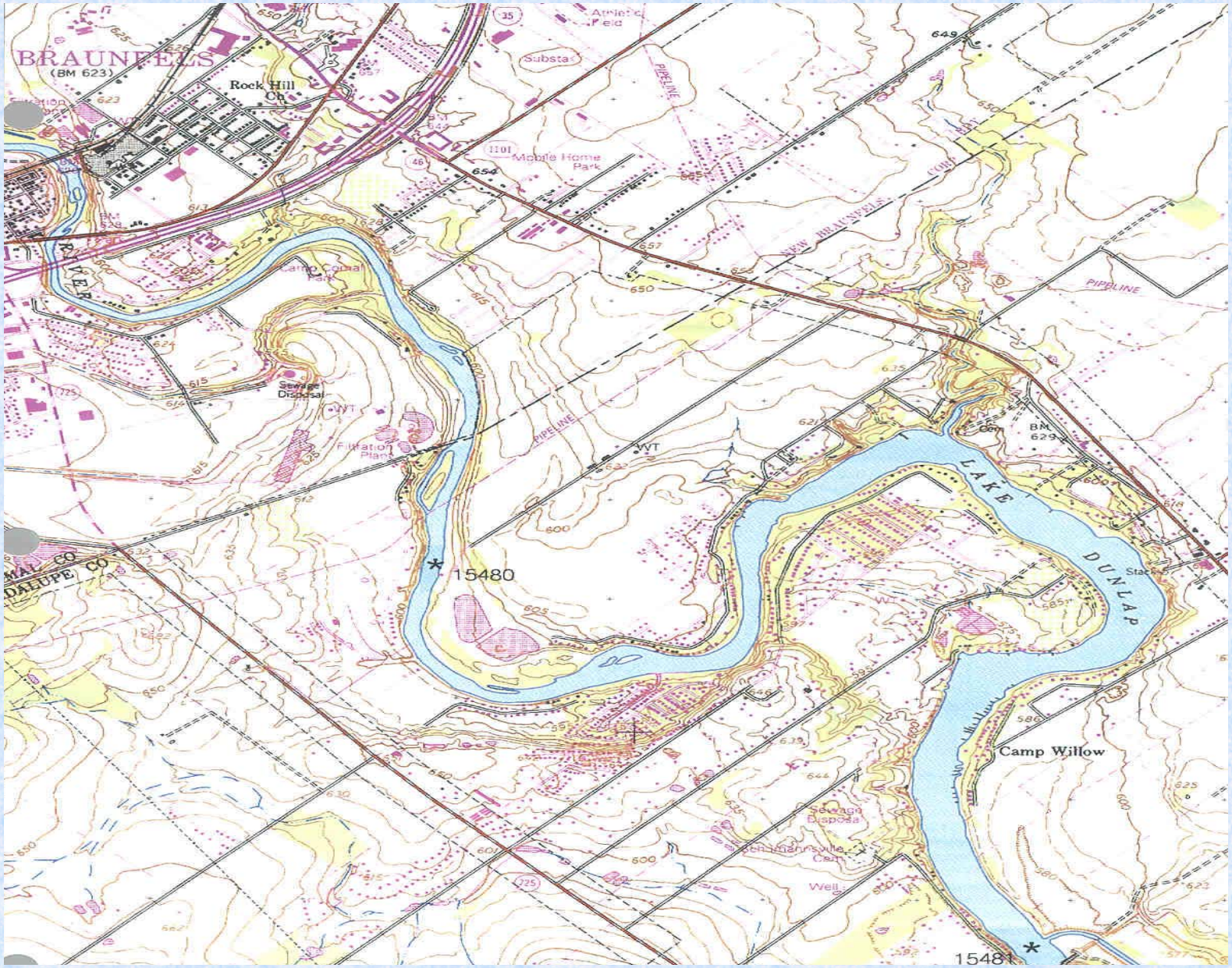
- 2 sites added to Lake Dunlap

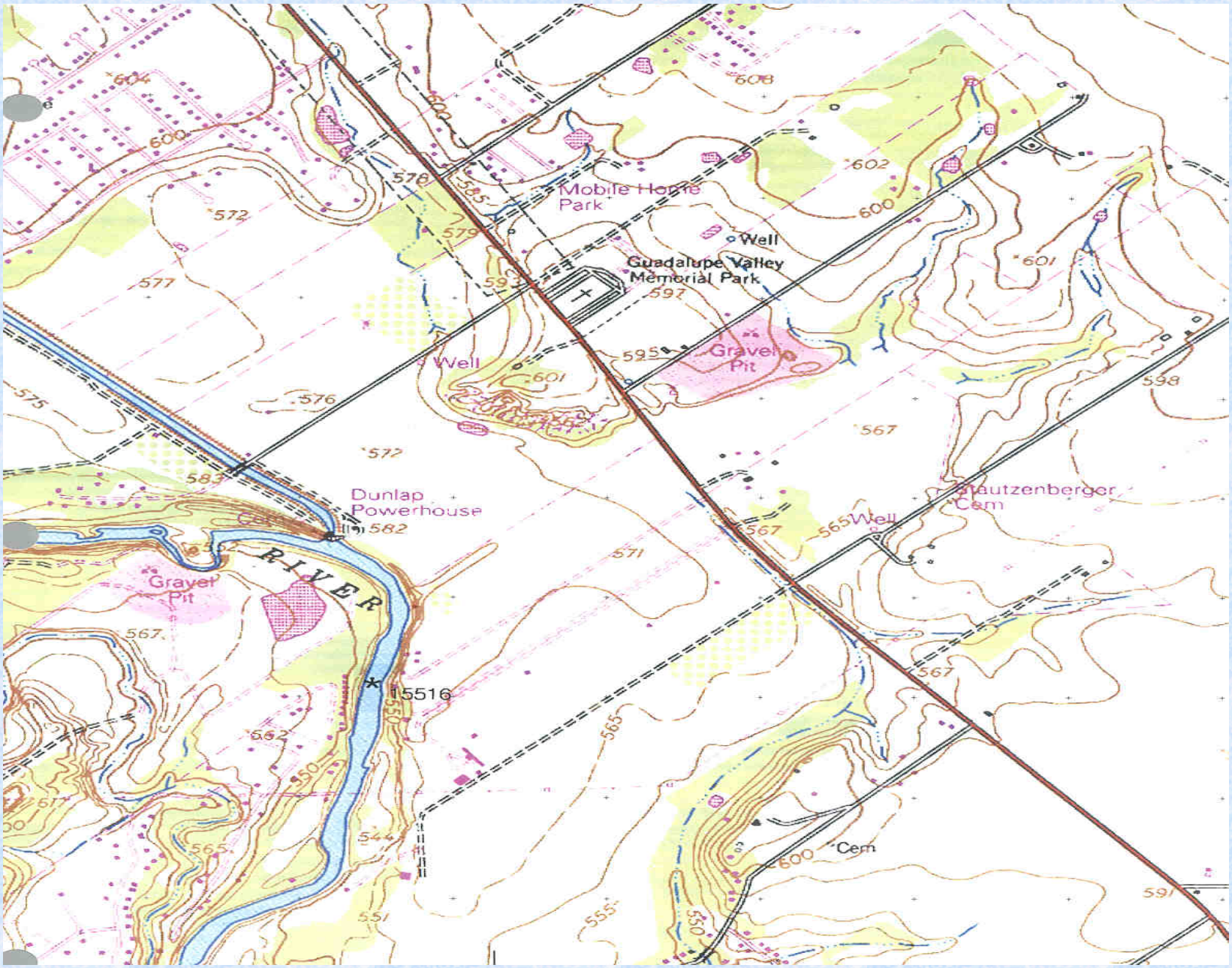
- 4 sites added to Lake McQueeney

- All current parameters plus Total Kjeldahl Nitrogen

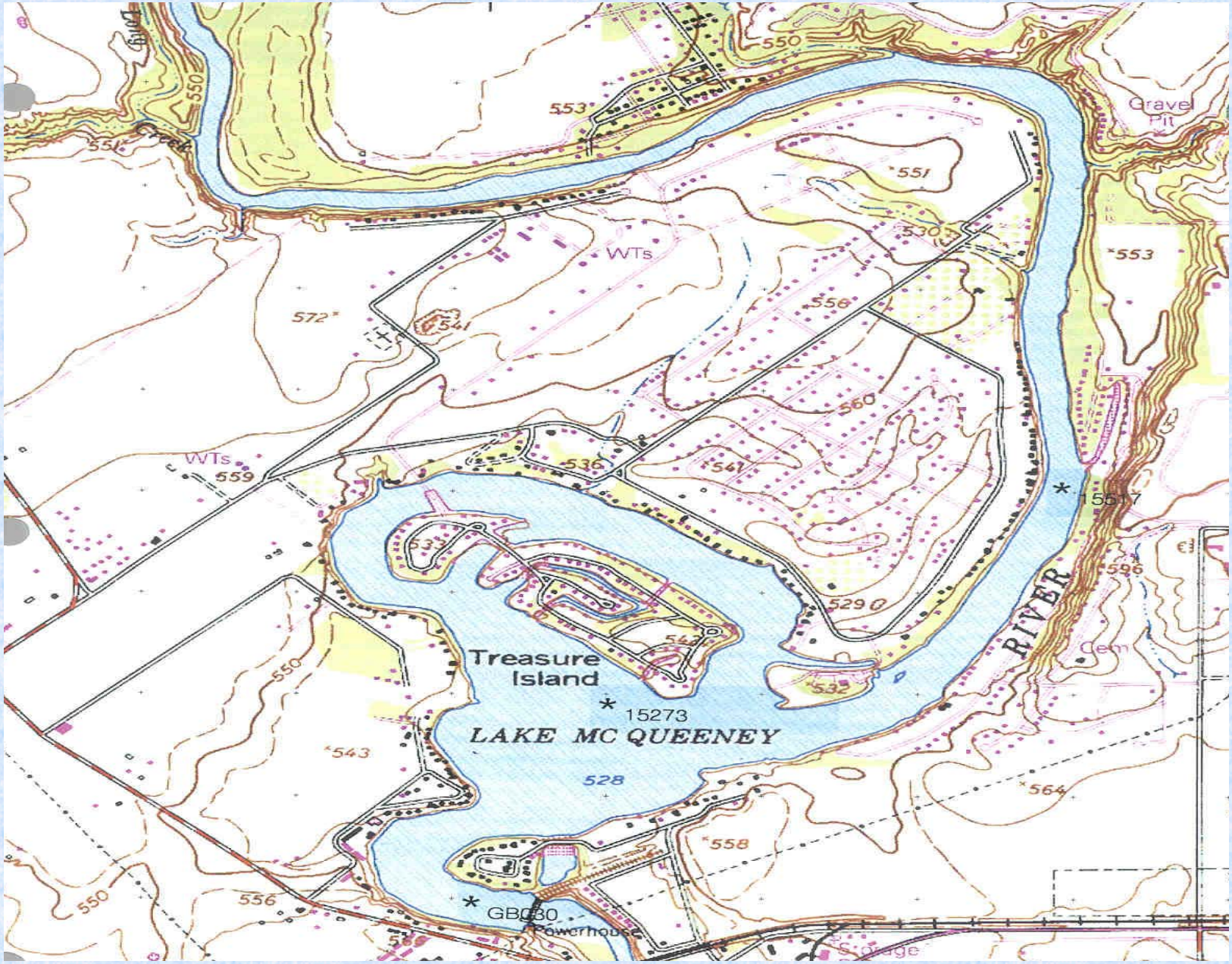
-Monitoring monthly April through October,

bimonthly November through March

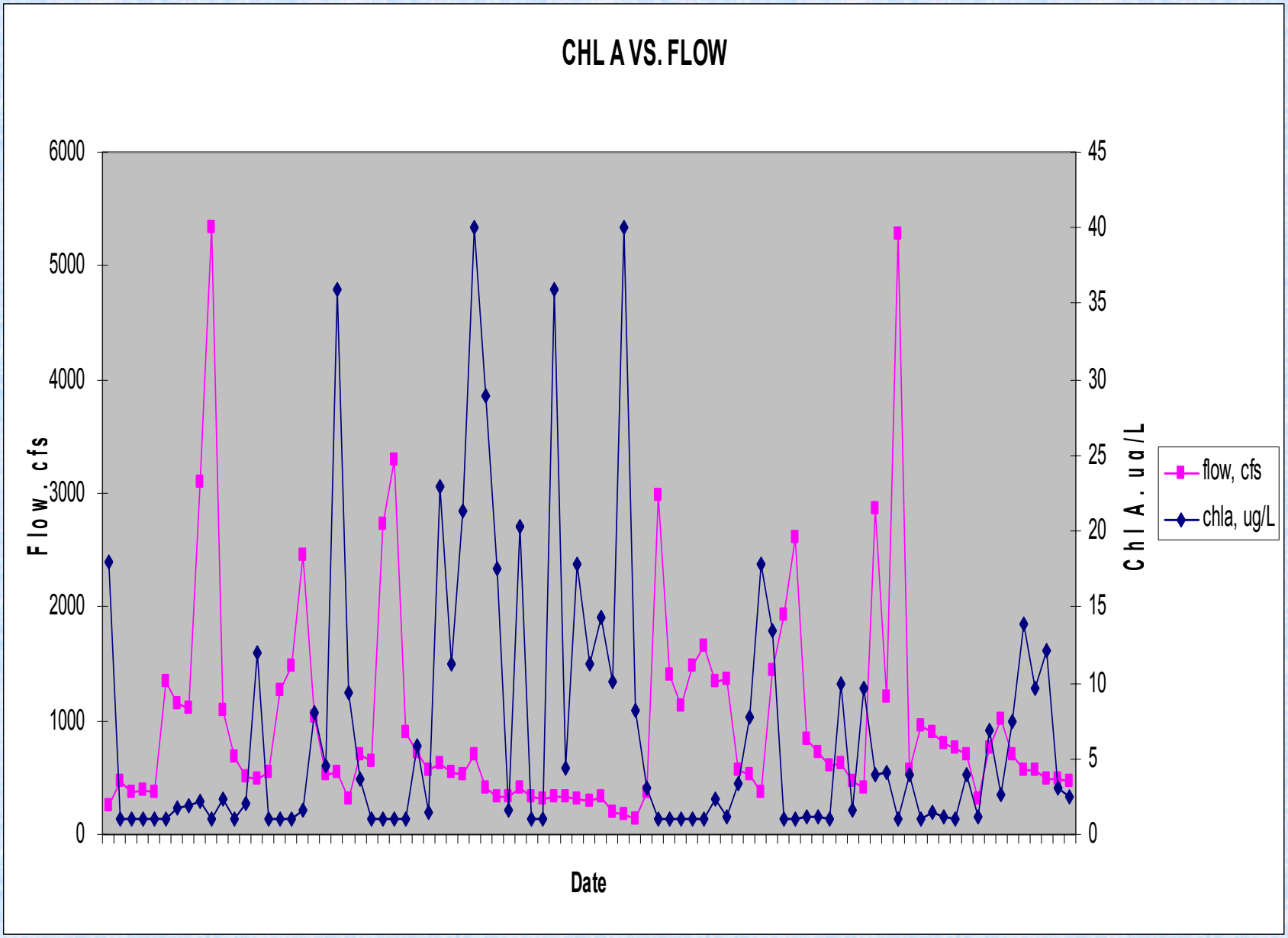

BRAUNFELS
(BM 623)
Rock Hill Ch
Athletic Field
Substa
Mobile Home Park
NEW BRAUNFELS
PIPELINE
RIVER
Sewage Disposal
Filtration Plant
WT
LAKE DUNLAP
BM 629
Camp Willow
Sewage Disposal
Well
15480
15481
GUADALUPE CO



Mobile Home Park
Well
Guadalupe Valley Memorial Park
Gravel Pit
Well
Dunlap Powerhouse
Cem
RIVER
Gravel Pit
15516
Stautzenberger Cem
Well
Cem

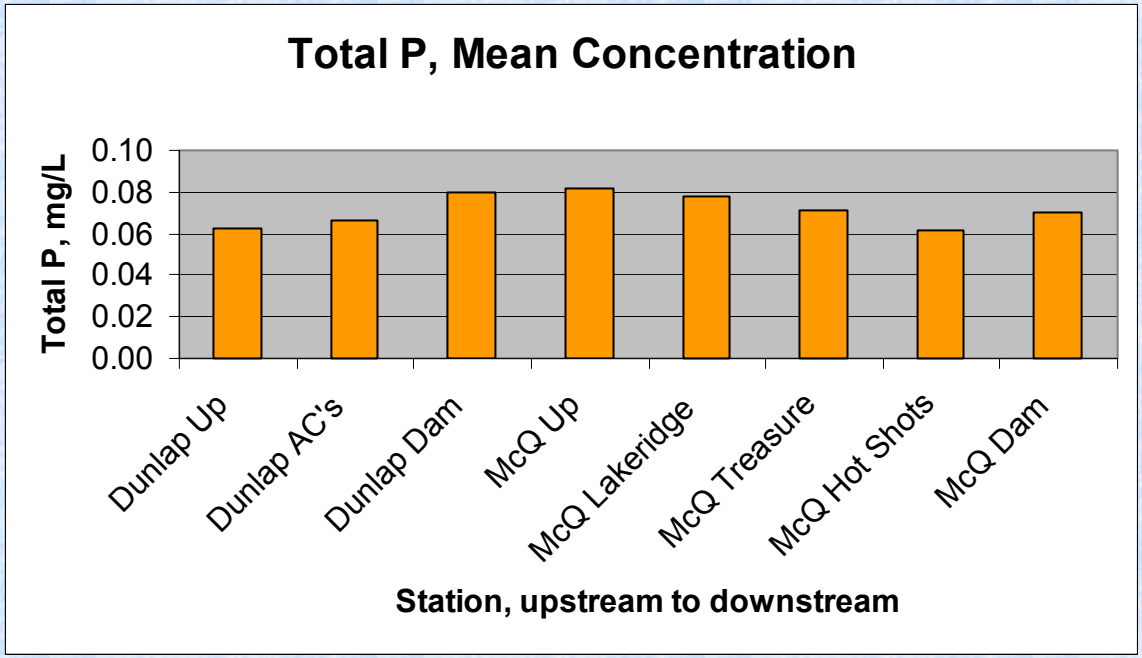


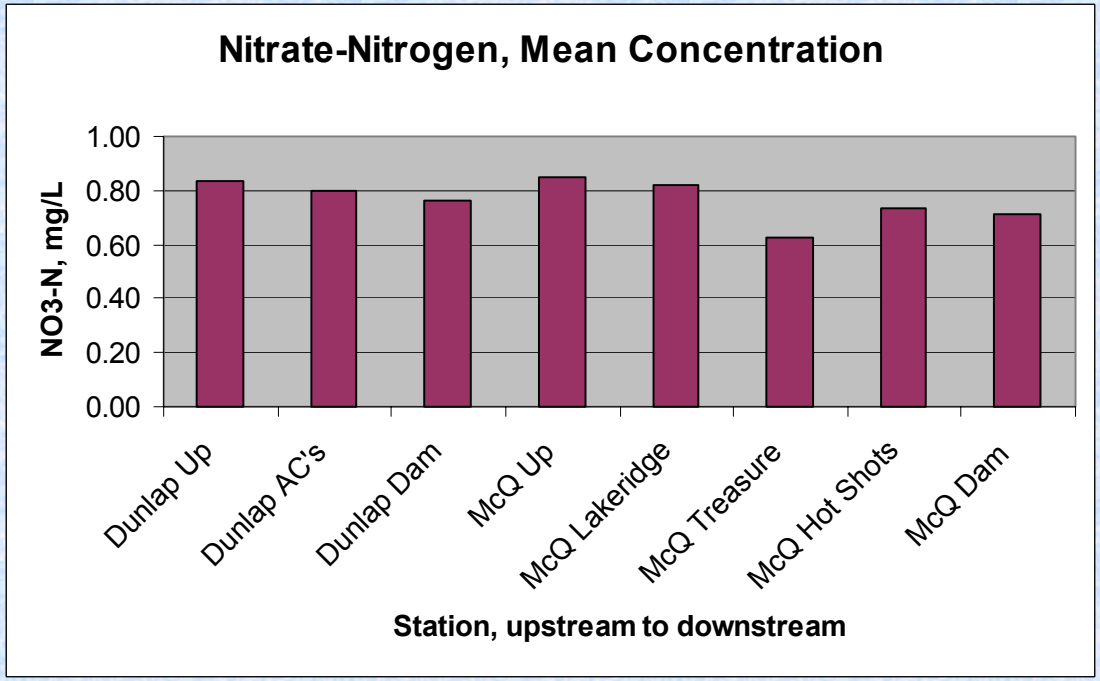
Treasure Island
LAKE MC QUEENEY
15273
15517
GB030
Powerhouse
RIVER
Gravel Pit
WTs
Cem
Storage
550
551
553
572
541
558
560
536
559
533
529
542
532
543
528
564
556

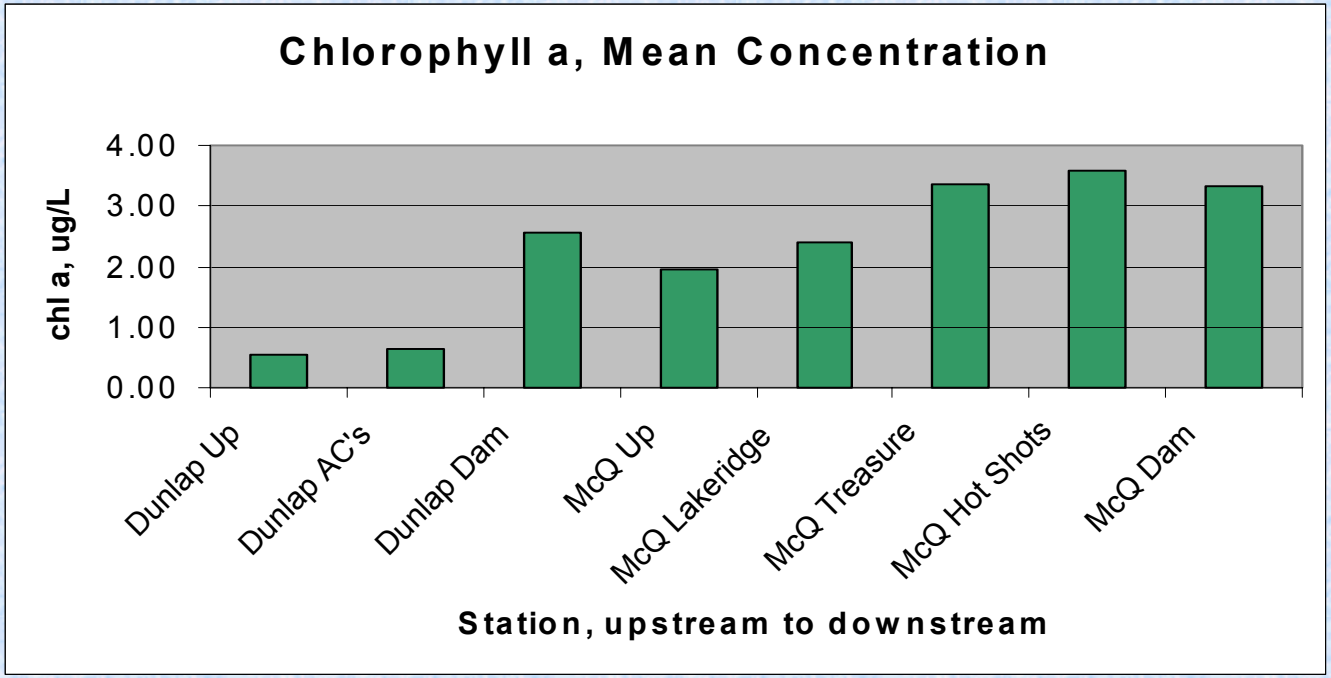

CHL A VS. FLOW
6000
5000
4000
3000
2000
1000
0
Flow, cfs
45
40
35
30
25
20
15
10
5
0
Chl A, ug/L
Date
flow, cfs
chla, ug/L

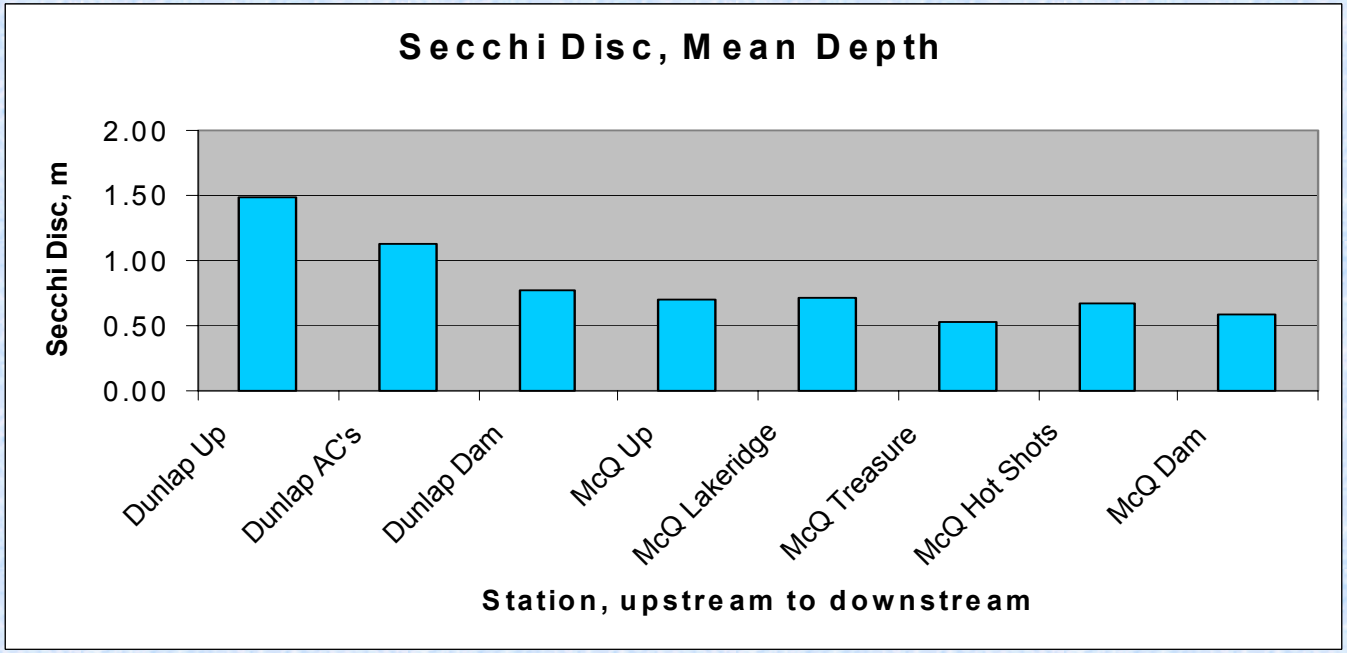
Nutrient Study on Lakes Dunlap and McQueeney

- Study did not clearly identify sources of nutrients but the spatial analyses of conditions moving downstream did show nutrient concentrations sufficient to promote algal photosynthetic activity.


Total P, Mean Concentration
Total P, mg/L
0.10
0.08
0.06
0.04
0.02
0.00
Dunlap Up
Dunlap AC's
Dunlap Dam
McQ Up
McQ Lakeridge
McQ Treasure
McQ Hot Shots
McQ Dam
Station, upstream to downstream

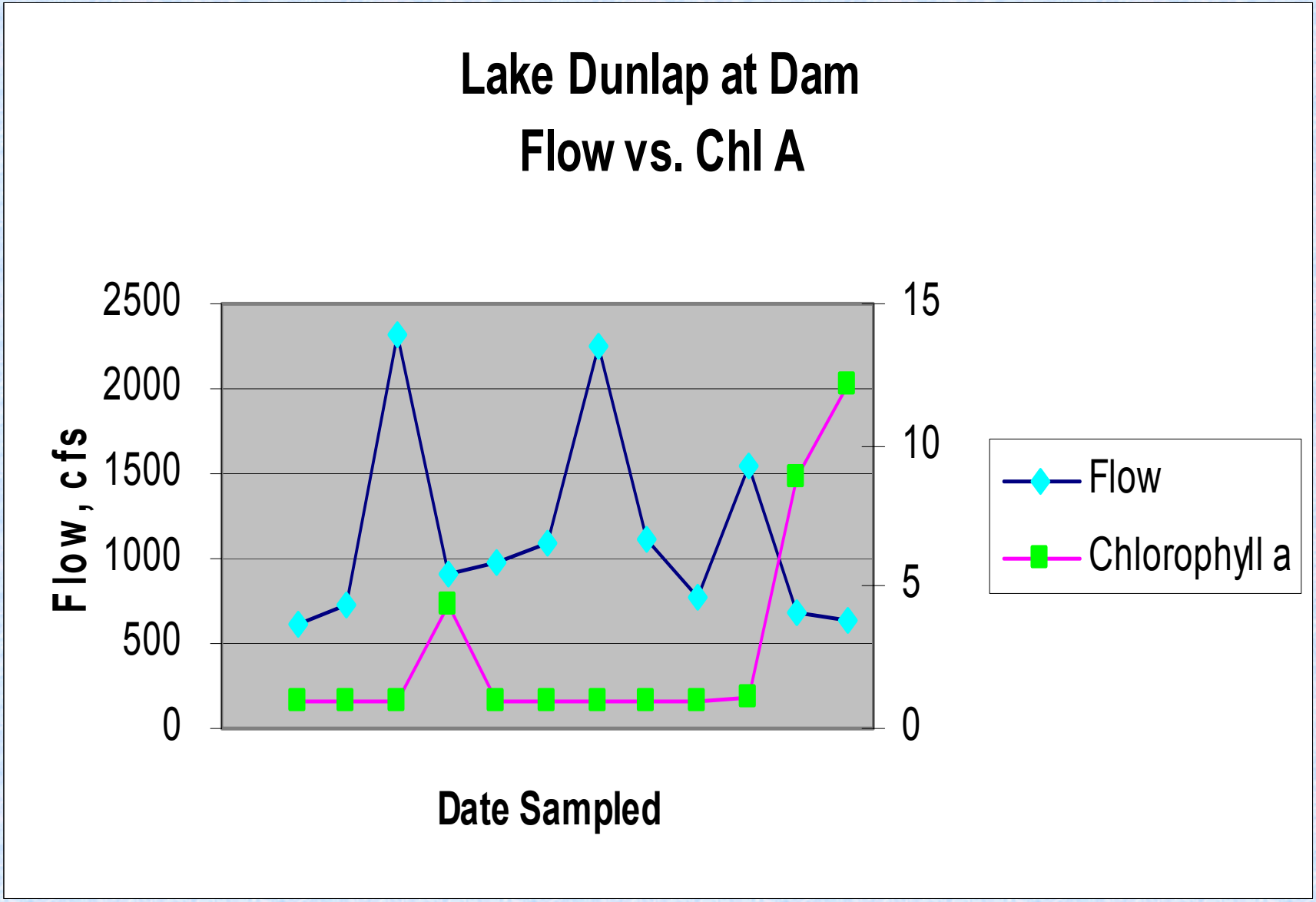

Nitrate-Nitrogen, Mean Concentration
NO3-N, mg/L
1.00
0.80
0.60
0.40
0.20
0.00
Dunlap Up
Dunlap AC's
Dunlap Dam
McQ Up
McQ Lakeridge
McQ Treasure
McQ Hot Shots
McQ Dam
Station, upstream to downstream

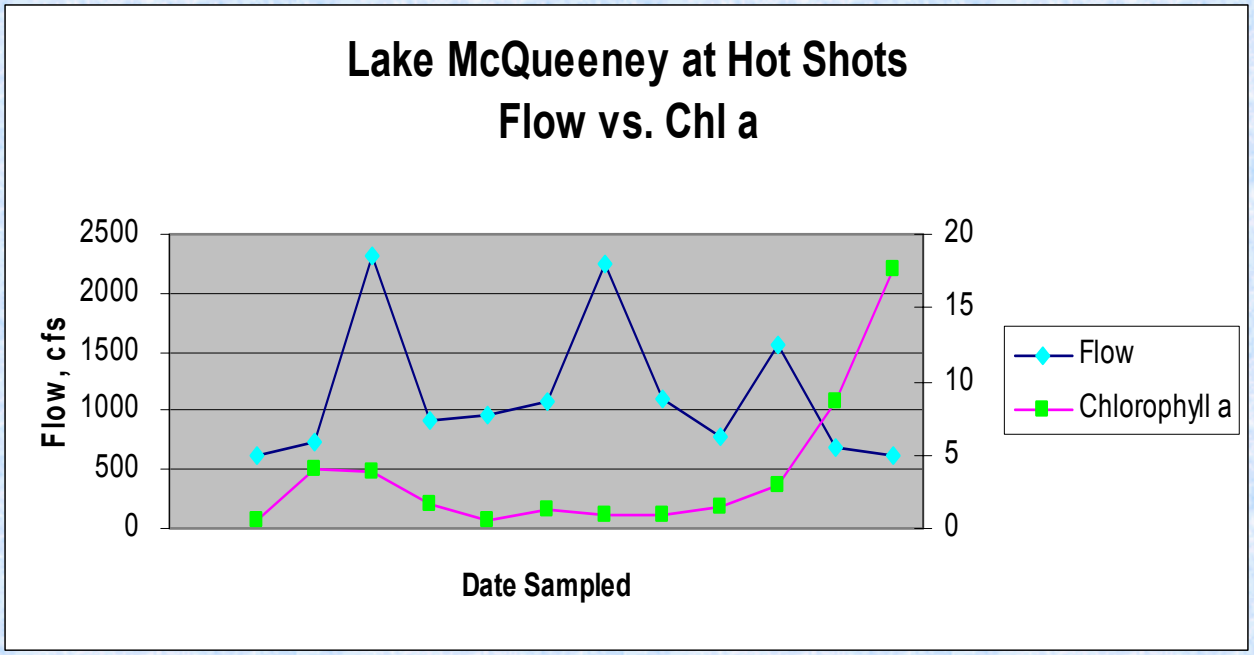

Chlorophyll a, Mean Concentration
chl a, ug/L
4.00
3.00
2.00
1.00
0.00
Dunlap Up
Dunlap AC's
Dunlap Dam
McQ Up
McQ Lakeridge
McQ Treasure
McQ Hot Shots
McQ Dam
Station, upstream to downstream

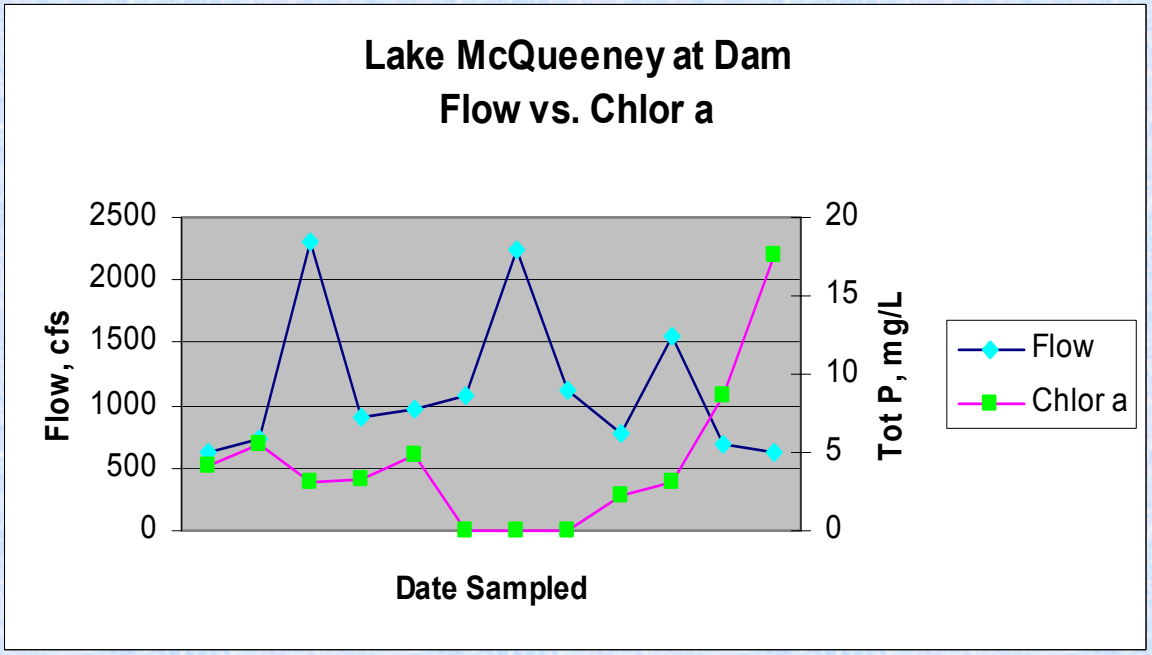

Secchi Disc, Mean Depth
Secchi Disc, m
2.00
1.50
1.00
0.50
0.00
Dunlap Up
Dunlap AC's
Dunlap Dam
McQ Up
McQ Lakeridge
McQ Treasure
McQ Hot Shots
McQ Dam
Station, upstream to downstream

Nutrient Study on Lakes Dunlap and McQueeney

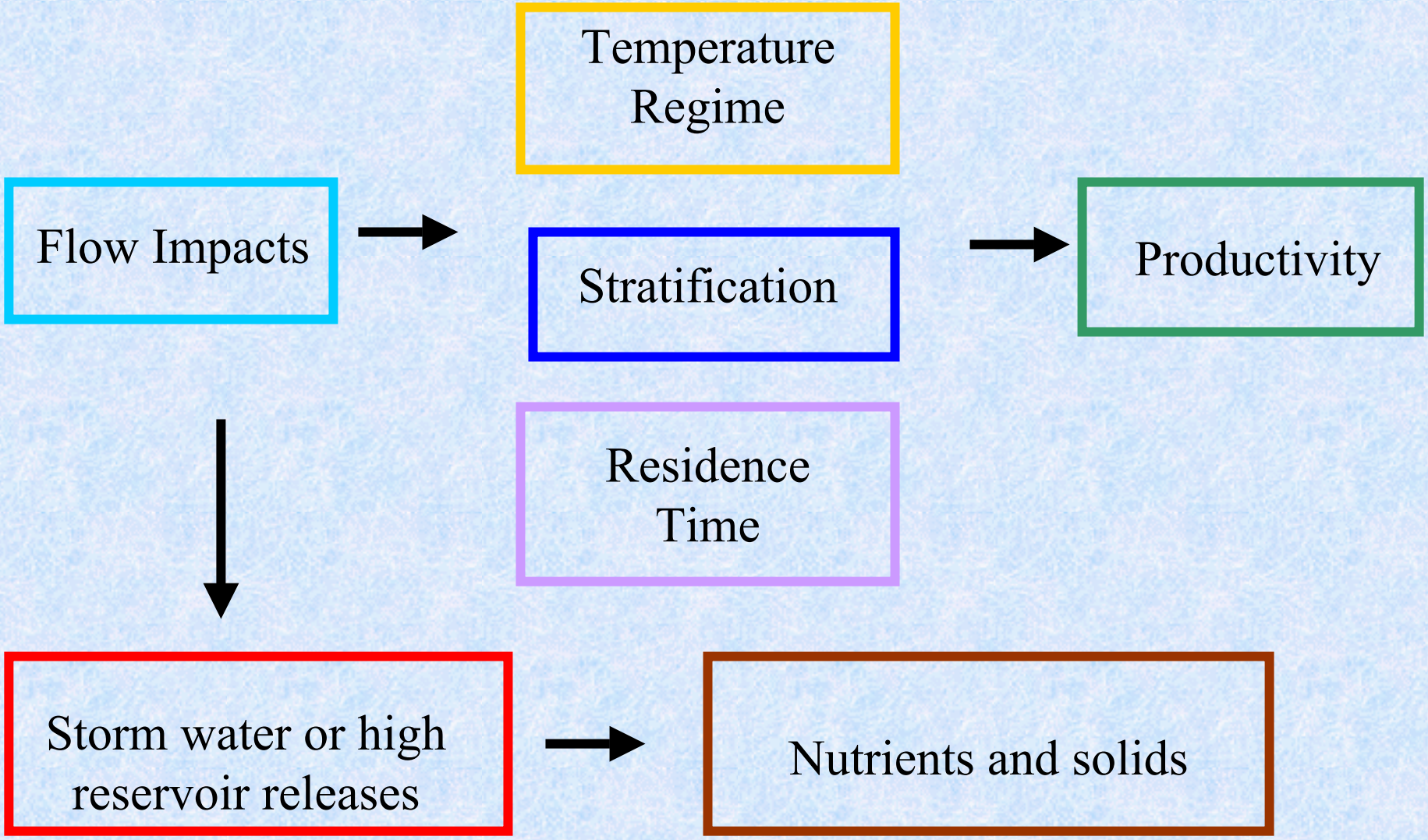
- Spike in chlorophyll a at downstream stations during the most prolonged period of low flow (June – August 2005)


Lake Dunlap at Dam
Flow vs. Chl A
2500
2000
1500
1000
500
0
Flow, cfs
15
10
5
0
Date Sampled
Flow
Chlorophyll a


Lake McQueeney at Hot Shots
Flow vs. Chl a
Flow, cfs
2500
2000
1500
1000
500
0
20
15
10
5
0
Date Sampled
Flow
Chlorophyll a

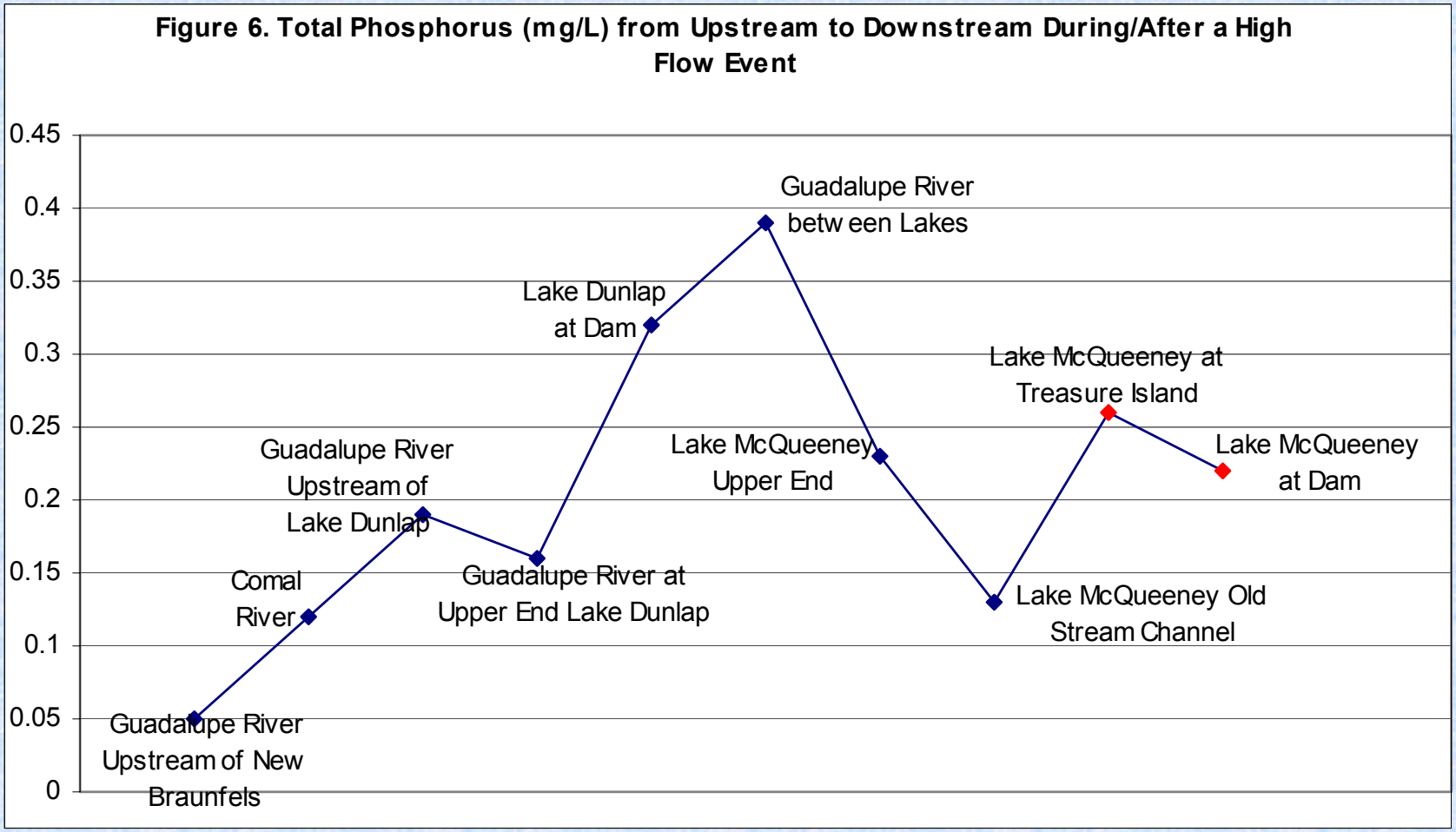

Lake McQueeney at Dam
Flow vs. Chlor a
Flow, cfs
2500
2000
1500
1000
500
0
20
15
10
5
0
Tot P, mg/L
Date Sampled
Flow
Chlor a

Most studies show that water quality conditions are contingent on flow



High Flow Event July 2004

- 40 days prior to the sampling in July, the releases from Canyon Reservoir fluctuated from 600 cfs to the maximum release of 5,000 cfs.
- COE fluctuated the releases from Canyon Reservoir in order to evacuate the flood pool created by a flood event in June 2004.
- Two-to-four fold increase in the concentration of total phosphorus seen spatially.
- Possible source: dissolved phosphorus from sediment/ water interface brought up with increase flow.
- Other high flow events did not show substantial rise in Tot P.
- Difference: base flow and reservoir releases at 5000 cfs in June and July 2004.



Station #:	13511	12653	15480	12596	15481	15516	15517	15149	15273	18213
Tot P:	0.05	0.12	0.19	0.16	0.32	0.39	0.23	0.13	0.26	0.22

Nutrient Standards for Run-of-River Impoundments

- Development of stream standards by TCEQ
- Must consider functionality due to high variability in flows
- Years of normal to high flow, responds like river
- Years of low flow, drought conditions, responds like reservoir

Quandary?

- Current screening levels for streams may allow too much algae to grow
- Current screening levels for reservoirs may be too restrictive

Anthropogenic Impacts

- **Population growth**

  - Call on more ground and surface water, minimizing base flow and increasing more low flow periods

  - Increase flow from wastewater treatment plants, increasing nutrient loading to stream

  - Increase in impervious cover, leading to increase storm water and reduction of recharge

- **Aging/failing septic tanks that can add nutrients to stream**