



# **Florida Department of Environmental Protection**

## **Water Quality Restoration Program**

# **Upper Ocklawaha Basin Working Group**

# **Trout Lake and Palatlakaha River Loading Updates November 20, 2015**

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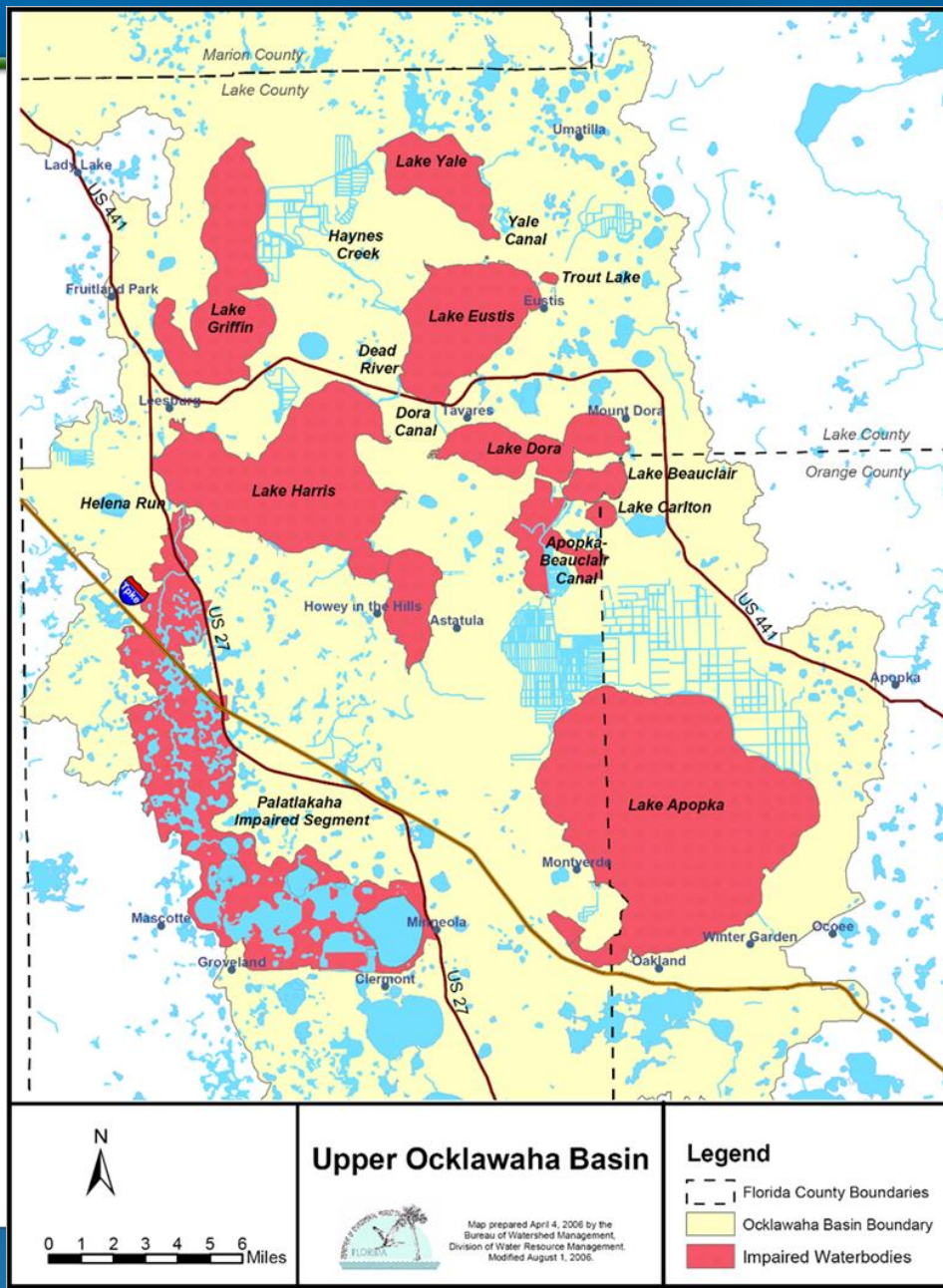


# Palatlakaha River Total Maximum Daily Load (TMDL)

- Specific to Waterbody Identification (WBID) 2839.
- Adopted in 2003.
- Watershed Management Model was used.



# Upper Ocklawaha Basin





# Updated Model Calculations

- Updated the loading estimates using 2009 land uses.
- Loading estimate changes do NOT change TMDL target (the loading goal).
- Used same Watershed Management Model (WMM) as the TMDL.
  - Simple spreadsheet model.
- Used the same rainfall and event mean concentrations (EMCs) from the TMDL.
- Septic systems and atmospheric deposition loads are implicit in the loading estimates.
- Upstream loading not included.
- Large lakes not included in the model.

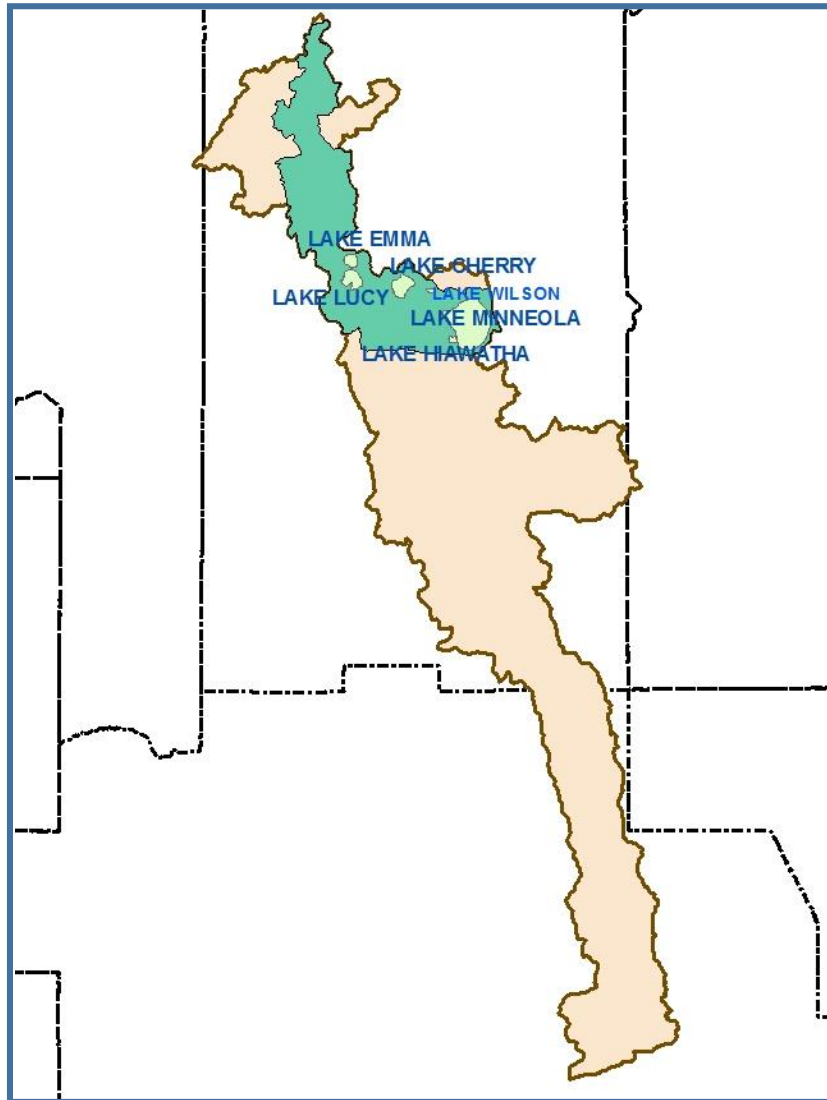


# Land Use Area

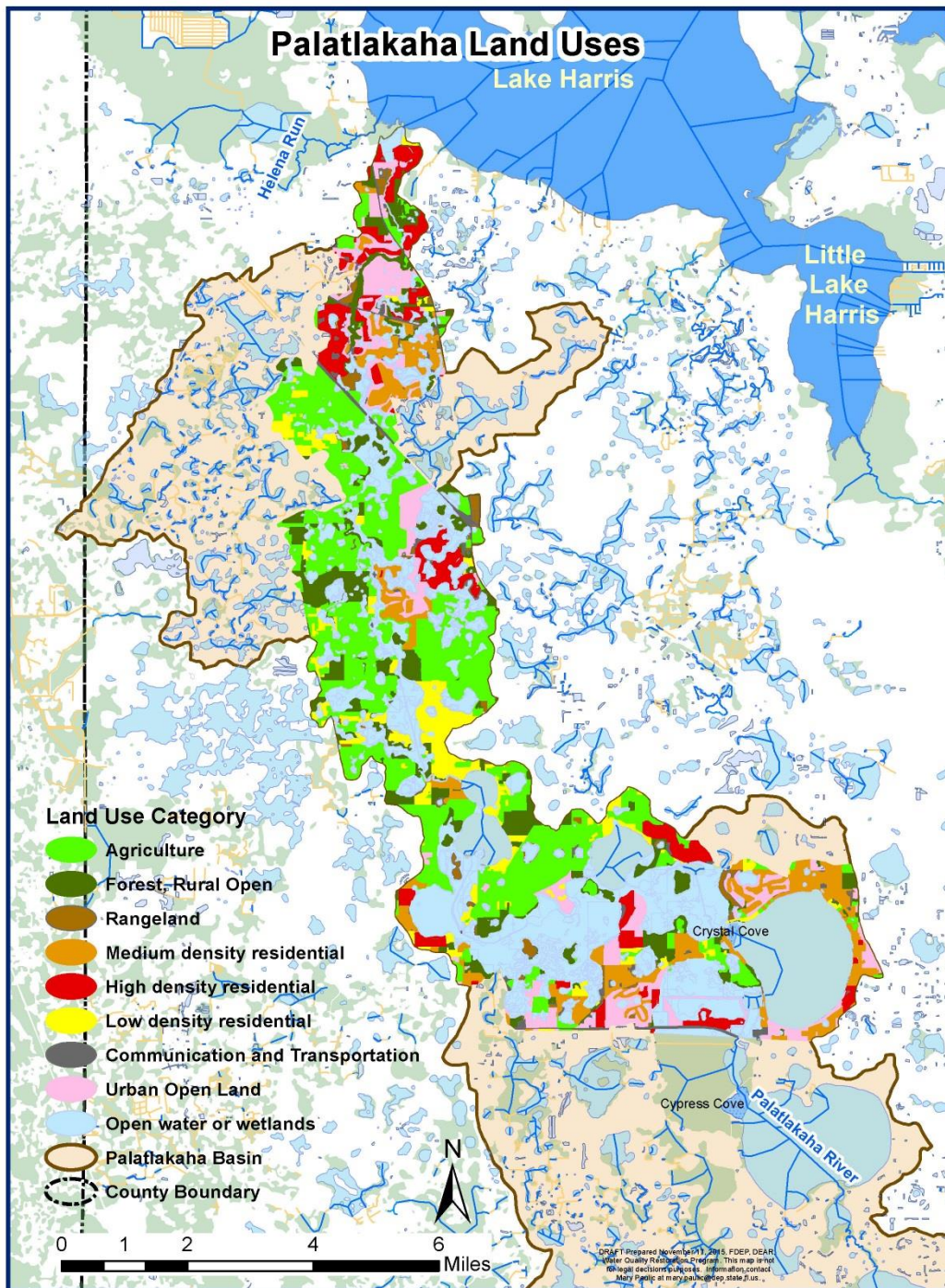
| Land Use                   | Acres            |
|----------------------------|------------------|
| Forest/Rural Open          | 2,254.00         |
| Urban Open                 | 2,044.50         |
| Agricultural               | 6,019.90         |
| Low Density Residential    | 1,305.80         |
| Medium Density Residential | 1,982.40         |
| High Density Residential   | 1,549.90         |
| Highways                   | 396.90           |
| Water                      | 8,336.30         |
| Rangeland                  | 471.20           |
| Wetlands                   | 0.00             |
| <b>Total</b>               | <b>24,360.90</b> |



# Palatlakaha Basin



- Lakes Emma, Cherry, Lucy, Wilson, Minneola, and Hiawatha not included.





# Results

| 2009 Land Use              | TN Load<br>(lbs/yr) | TP Load<br>(lbs/yr) |
|----------------------------|---------------------|---------------------|
| Septic Tanks               | 0                   | 0                   |
| Forest/Rural Open          | 157.9               | 22.6                |
| Urban Open                 | 482.9               | 61.4                |
| Agricultural               | 2,795.7             | 414.5               |
| Low Density Residential    | 780.3               | 78.0                |
| Medium Density Residential | 2,848.3             | 373.1               |
| High Density Residential   | 3,440.4             | 696.6               |
| Highways                   | 590.0               | 96.4                |
| Water / Wetlands           | 8,368.6             | 993.8               |
| Rangeland                  | 218.8               | 32.4                |
| <b>Total</b>               | <b>19,683.0</b>     | <b>2,768.9</b>      |



# Loading by Category

| Category               | TP load<br>(lbs/yr TP) |
|------------------------|------------------------|
| Developed Land use     | 1,305.6                |
| Agriculture            | 414.5                  |
| Natural Areas          | 1,048.8                |
| <b>Total Developed</b> | <b>1,720.1</b>         |

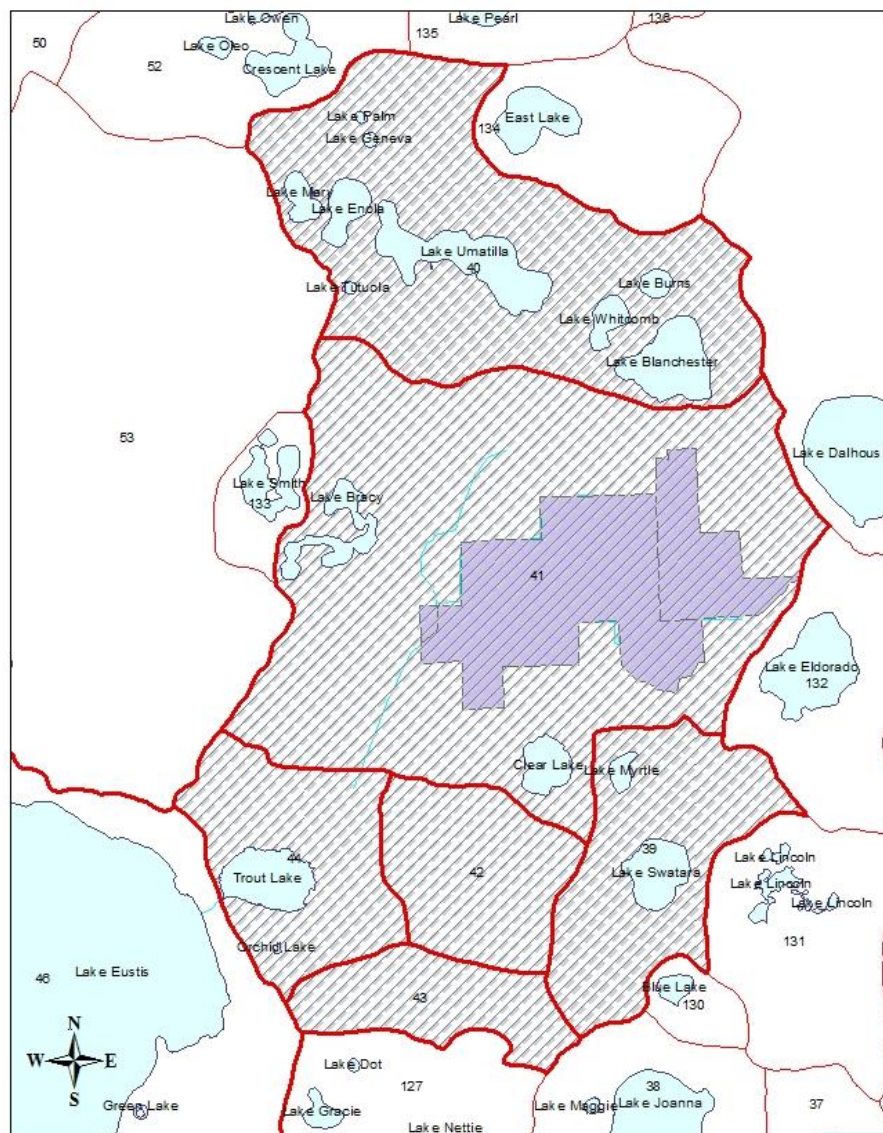


# Trout Lake TMDL

- Estimating current loads using 2009 land uses instead of the 1995 land uses that were available when the TMDL was developed.
- Methodology revised to match other Harris Chain of Lakes TMDLs.
  - Spreadsheet model.
  - Estimates loads using soil hydrologic group and land use.
- Does NOT change TMDL nutrient targets.



## TROUT WATERSHED

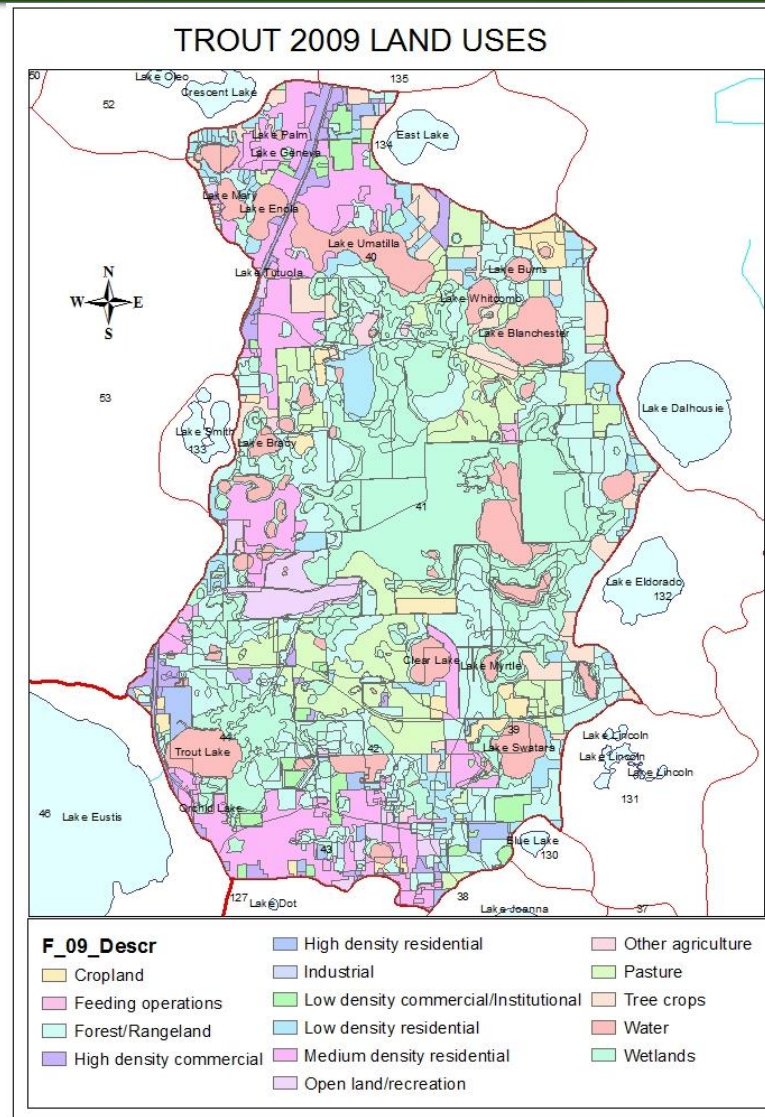


□ EUSTIS SUB-BASINS    ▨ Trout Sub-Basins 39 - 44

0 0.2 0.4 0.8 1.2 1.6 2 Miles

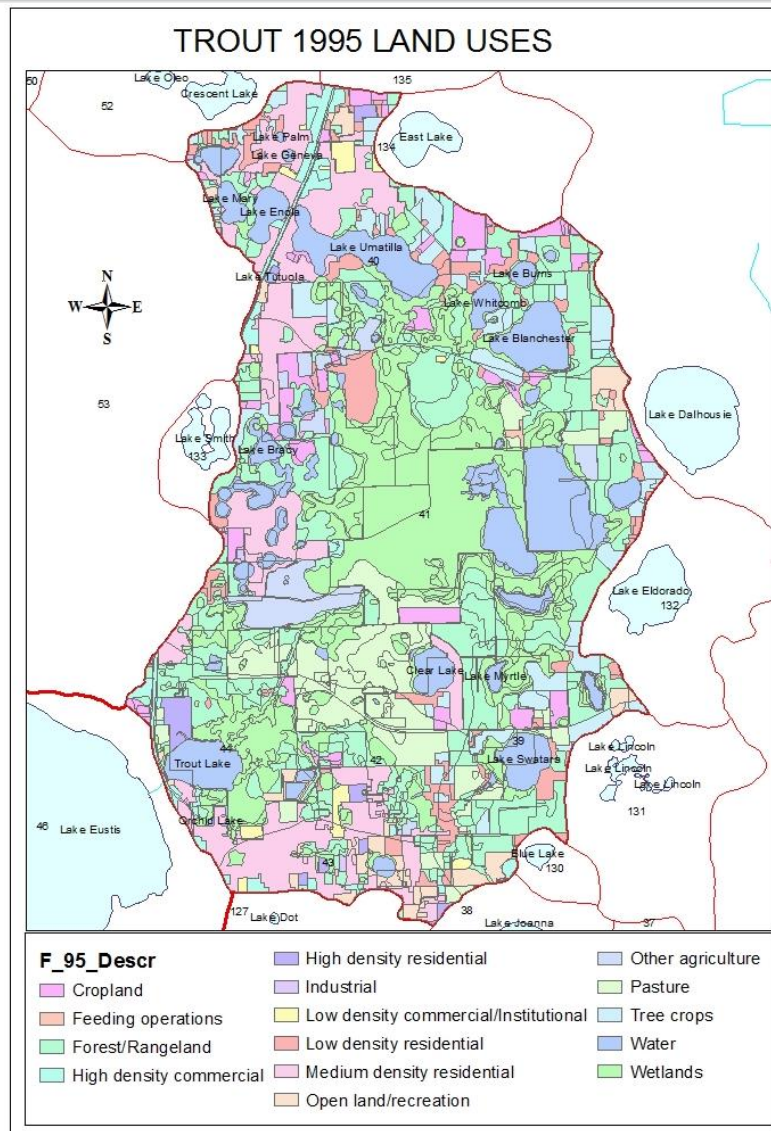


# 2009 Land Use





# 1995 Land Use





# Land Use Comparison

| Land Use Category                    | 1995 Land Use<br>(Hectares [Ha]) | 2009 Land Use<br>(Ha) |
|--------------------------------------|----------------------------------|-----------------------|
| Low density residential              | 180.21                           | 199.04                |
| Medium density residential           | 460.65                           | 493.59                |
| High density residential             | 32.55                            | 43.78                 |
| Low density commercial               | 35.18                            | 69.07                 |
| High density commercial              | 89.77                            | 100.39                |
| Industrial                           | 3.04                             | 1.40                  |
| Mining                               | 0.00                             | 0.00                  |
| Open land/recreational               | 84.66                            | 94.80                 |
| Pasture                              | 302.26                           | 402.16                |
| Cropland                             | 153.22                           | 79.32                 |
| Tree crops                           | 196.13                           | 150.17                |
| Feeding operations                   | 2.75                             | 5.03                  |
| Other agriculture                    | 97.01                            | 16.54                 |
| Forest/rangeland                     | 812.65                           | 800.70                |
| Water                                | 402.58                           | 371.80                |
| Wetlands                             | 710.13                           | 727.20                |
| Spray fields (rainfall only)         | 11.17                            | 18.94                 |
| Muck farms (runoff coefficient est.) | 344.85                           | 344.85                |
| <b>SUM</b>                           | <b>3,918.80</b>                  | <b>3,918.79</b>       |



# Total Nitrogen Loadings

| Trout Lake TN Loads (kg/yr) |                              |                              |                                          |
|-----------------------------|------------------------------|------------------------------|------------------------------------------|
| Year                        | Based on 1995 Land Use/Soils | Based on 2009 Land Use/Soils | Percent Difference Between 2009 and 1995 |
| 1991                        | 27379.25                     | 26998.41                     | -1.39                                    |
| 1992                        | 17466.40                     | 17148.73                     | -1.82                                    |
| 1993                        | 12071.76                     | 11796.30                     | -2.28                                    |
| 1994                        | 18832.54                     | 18437.40                     | -2.10                                    |
| 1995                        | 16166.95                     | 15832.83                     | -2.07                                    |
| 1996                        | 13334.43                     | 13014.66                     | -2.40                                    |
| 1997                        | 14128.13                     | 13793.57                     | -2.37                                    |
| 1998                        | 14653.05                     | 14353.80                     | -2.04                                    |
| 1999                        | 16467.94                     | 16124.83                     | -2.08                                    |
| 2000                        | 8419.86                      | 8224.01                      | -2.33                                    |
| <b>AVERAGE</b>              | <b>15,892.03</b>             | <b>15,572.45</b>             | <b>-2.09</b>                             |



# Total Phosphorus Loadings

| Trout Lake TP loads (kg/yr) |                              |                              |                                          |
|-----------------------------|------------------------------|------------------------------|------------------------------------------|
| Year                        | Based on 1995 Land Use/Soils | Based on 2009 Land Use/Soils | Percent Difference Between 2009 and 1995 |
| 1991                        | 3192.46                      | 3107.60                      | -2.66                                    |
| 1992                        | 1813.11                      | 1742.33                      | -3.90                                    |
| 1993                        | 1081.93                      | 1020.55                      | -5.67                                    |
| 1994                        | 1821.61                      | 1733.56                      | -4.83                                    |
| 1995                        | 1564.77                      | 1490.32                      | -4.76                                    |
| 1996                        | 1163.28                      | 1092.02                      | -6.13                                    |
| 1997                        | 1420.47                      | 1345.92                      | -5.25                                    |
| 1998                        | 1172.63                      | 1105.94                      | -5.69                                    |
| 1999                        | 1863.22                      | 1786.76                      | -4.10                                    |
| 2000                        | 739.34                       | 695.70                       | -5.90                                    |
| <b>AVERAGE</b>              | <b>1,583.28</b>              | <b>1,512.07</b>              | <b>-4.89</b>                             |



# Comparison 1991-2000

| Trout Lake TP loads (kg/yr) |                              |                              |                                      |
|-----------------------------|------------------------------|------------------------------|--------------------------------------|
| Year                        | Based on 1995 Land Use/Soils | Based on 2009 Land Use/Soils | Percent Change Between 2009 and 1995 |
| 1991                        | 3192.46                      | 3107.60                      | -2.66                                |
| 1992                        | 1813.11                      | 1742.33                      | -3.90                                |
| 1993                        | 1081.93                      | 1020.55                      | -5.67                                |
| 1994                        | 1821.61                      | 1733.56                      | -4.83                                |
| 1995                        | 1564.77                      | 1490.32                      | -4.76                                |
| 1996                        | 1163.28                      | 1092.02                      | -6.13                                |
| 1997                        | 1420.47                      | 1345.92                      | -5.25                                |
| 1998                        | 1172.63                      | 1105.94                      | -5.69                                |
| 1999                        | 1863.22                      | 1786.76                      | -4.10                                |
| 2000                        | 739.34                       | 695.70                       | -5.90                                |
| <b>AVERAGE</b>              | <b>1,583.28</b>              | <b>1,512.07</b>              | <b>-4.89</b>                         |



# Comparison to TMDL 1995-2000

| Trout Lake TP loads (kg/yr) |                                                        |                      |                |
|-----------------------------|--------------------------------------------------------|----------------------|----------------|
| Year                        | Revised Modeling Approach Based on 1995 Land Use/Soils | TMDL Estimated Loads | Percent Change |
| 1995                        | 1564.77                                                | 1287.77              | 17.70          |
| 1996                        | 1163.28                                                | 1431.56              | -23.06         |
| 1997                        | 1420.47                                                | 1384.84              | 2.51           |
| 1998                        | 1172.63                                                | 918.54               | 21.67          |
| 1999                        | 1863.22                                                | 1337.67              | 28.21          |
| 2000                        | 739.34                                                 | 727.57               | 1.59           |
| <b>AVERAGE</b>              | <b>1,320.62</b>                                        | <b>1,181.33</b>      | <b>8.10</b>    |

| Trout Lake TN loads (kg/yr) |                                                        |                      |                |
|-----------------------------|--------------------------------------------------------|----------------------|----------------|
| Year                        | Revised Modeling Approach Based on 1995 Land Use/Soils | TMDL Estimated Loads | Percent Change |
| 1995                        | 16166.95                                               | 11960.07             | 26.02          |
| 1996                        | 13334.43                                               | 13285.94             | 0.36           |
| 1997                        | 14128.13                                               | 12863.64             | 8.95           |
| 1998                        | 14653.05                                               | 8523.60              | 41.83          |
| 1999                        | 16467.94                                               | 12420.93             | 24.58          |
| 2000                        | 8419.86                                                | 6714.64              | 20.25          |
| <b>AVERAGE</b>              | <b>13,861.73</b>                                       | <b>10,961.47</b>     | <b>20.33</b>   |



# Trout Lake Summary

- Time Period 1995-2000.
- Annual Average Loading to Trout Lake:
  - 24,165 lbs/yr TN (10,961 kg/yr).
  - 2,604 lbs/yr TP (1,181 kg/yr)(TMDL estimate).
  - 2,762 lbs/yr TP (1,253 kg/yr)(revised model).
- Annual TMDL Loads:
  - 9,733 lbs/yr TN (4,415 kg/yr).
  - 521 lbs/yr TP (236 kg/yr).

A photograph of an empty lecture hall with rows of blue seats. The seats are arranged in a tiered fashion, facing towards the front of the room. The background is a plain, light-colored wall.

• Any comments or questions???