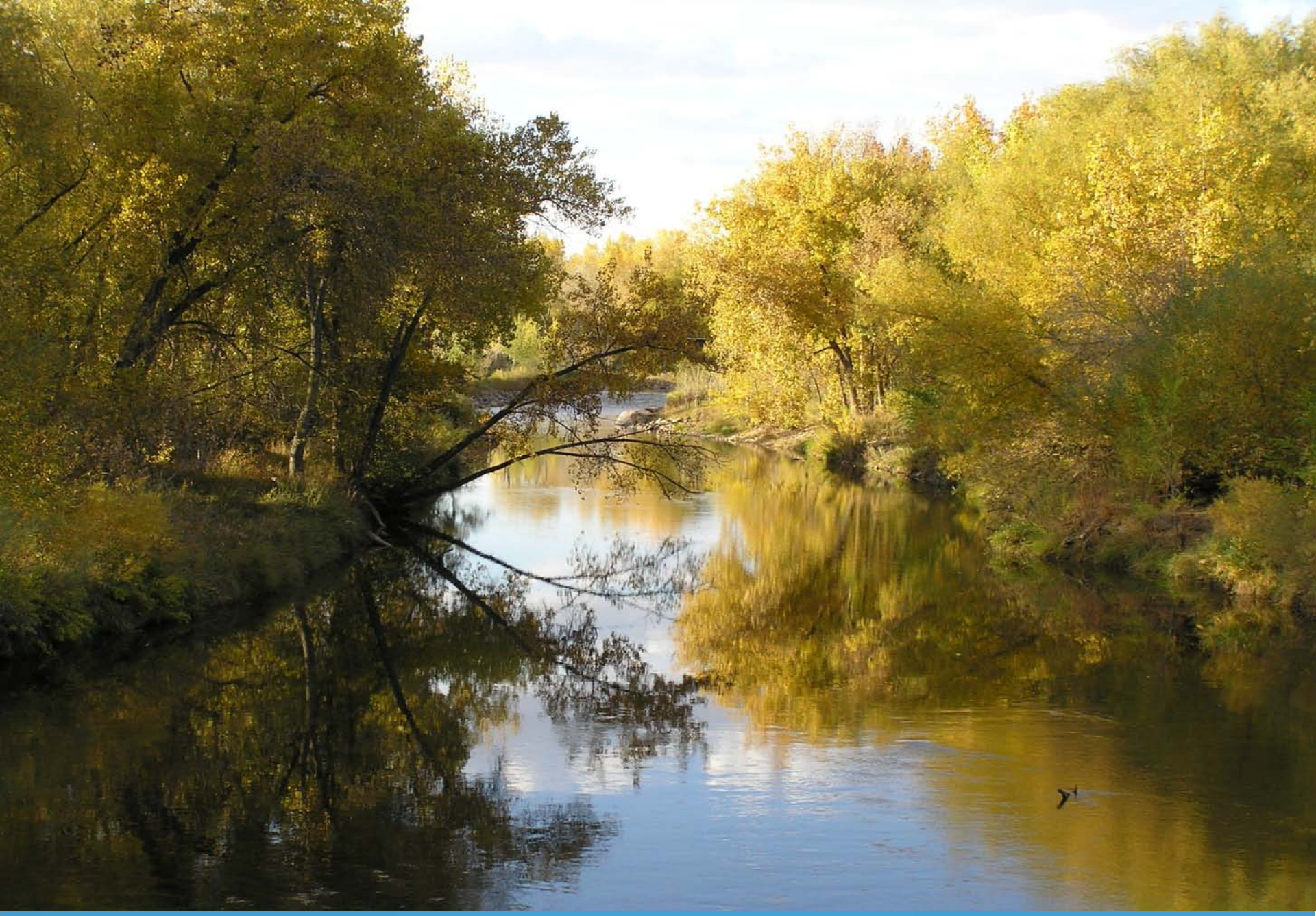
Controlling Nutrients in Surface Waters

City of Greeley

The Poudre Runs Through It Forum

February 8, 2014

"Eventually, all things merge into one,
and a river runs through it."
Norman Maclean



Cache la Poudre near Greeley

Snowy Egret at Greeley WWTP Effluent Outfall

We have come a long way

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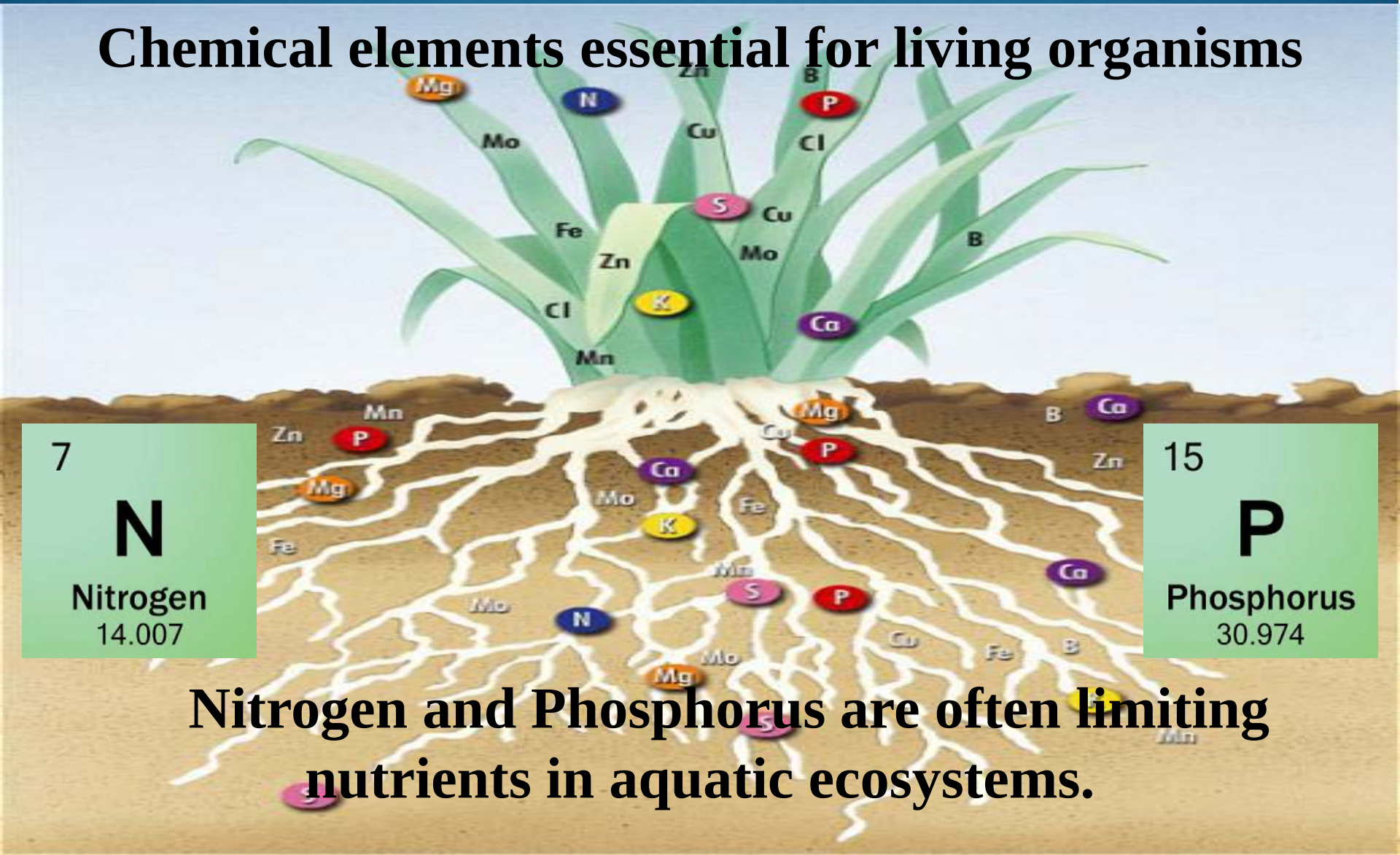
Cleveland Plain Dealer photo

Nutrients. . .

Chemical elements essential for living organisms



Nitrogen and Phosphorus are often limiting nutrients in aquatic ecosystems.

Effects of Nutrient Pollution

Excessive Biological Growth Can Cause...

- Algal blooms which can sometimes be toxic
- Eutrophication
  - Low oxygen conditions leading to fish kills and decreased biodiversity
- Taste and odor problems for drinking water providers
  - August 2010 Greeley was spending $4,000 per day on treatment to minimize foul taste and odors caused by algae in Boyd Lake

Yampa Basin, Stagecoach Reservoir, Secchi disk is submerged 0.5m

Eutrophication

- Excessive nutrients may cause algal blooms
  - Prevents photosynthesis
  - Releases bad odors, taste, or toxins
- Decaying algae consumes dissolved oxygen
  - Low oxygen conditions may cause fish kills

Boulder Creek upstream of Coal Creak near Gooding. July 10, 2007

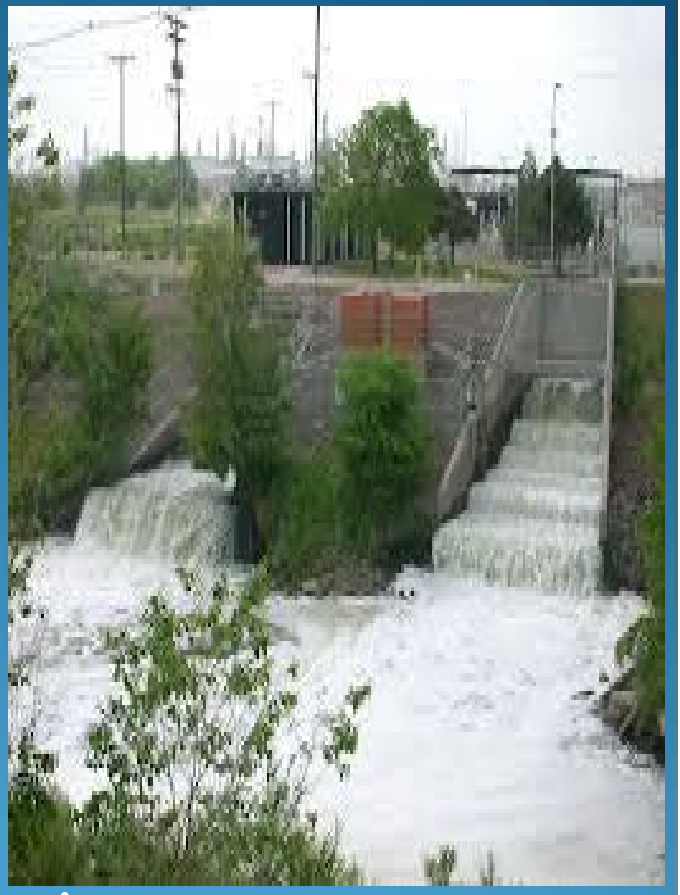
Sago Pondweed above Greeley WWTP, 2007

Sources of Nutrient Pollution

In a mixed land use region such as the Cache la Poudre Watershed, nutrients enter surface waters from point sources and non-point sources.

Point Sources

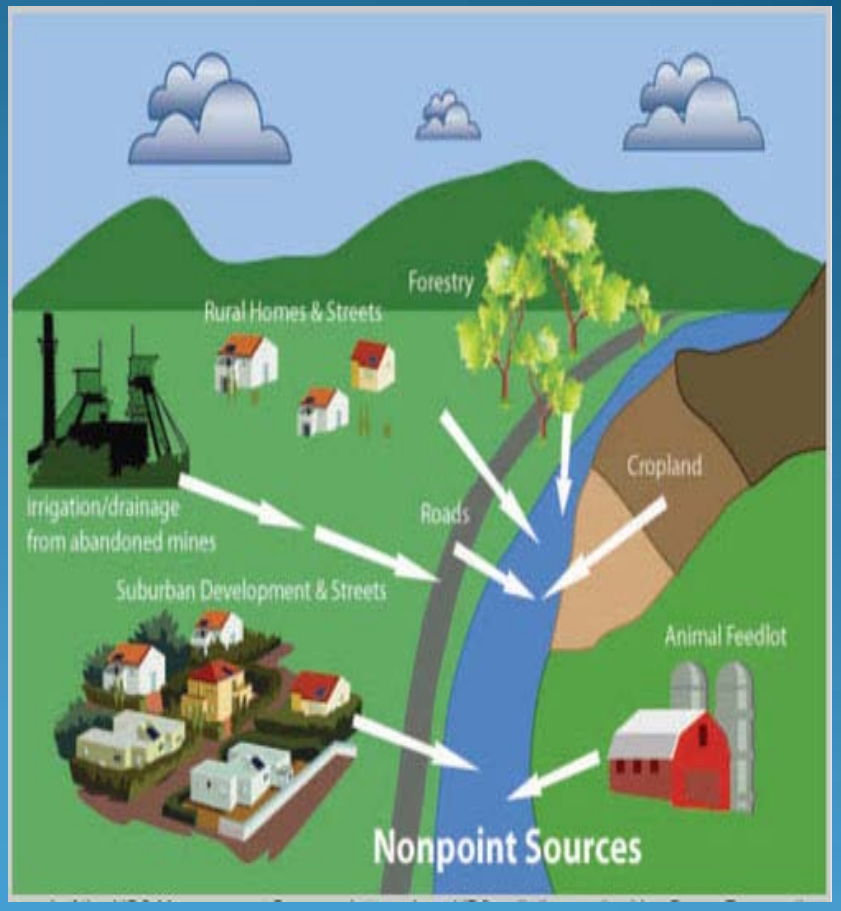
- Pipes putting cleaned water back into the river
  - Wastewater Treatment Plants
  - Industrial Plants
  - Confined Animal Feeding Operations
- Point sources have a mostly constant discharge of pollutants
  - As stream flows decrease, the point source can come to dominate



Denver metropolitan wastewater reclamation district.

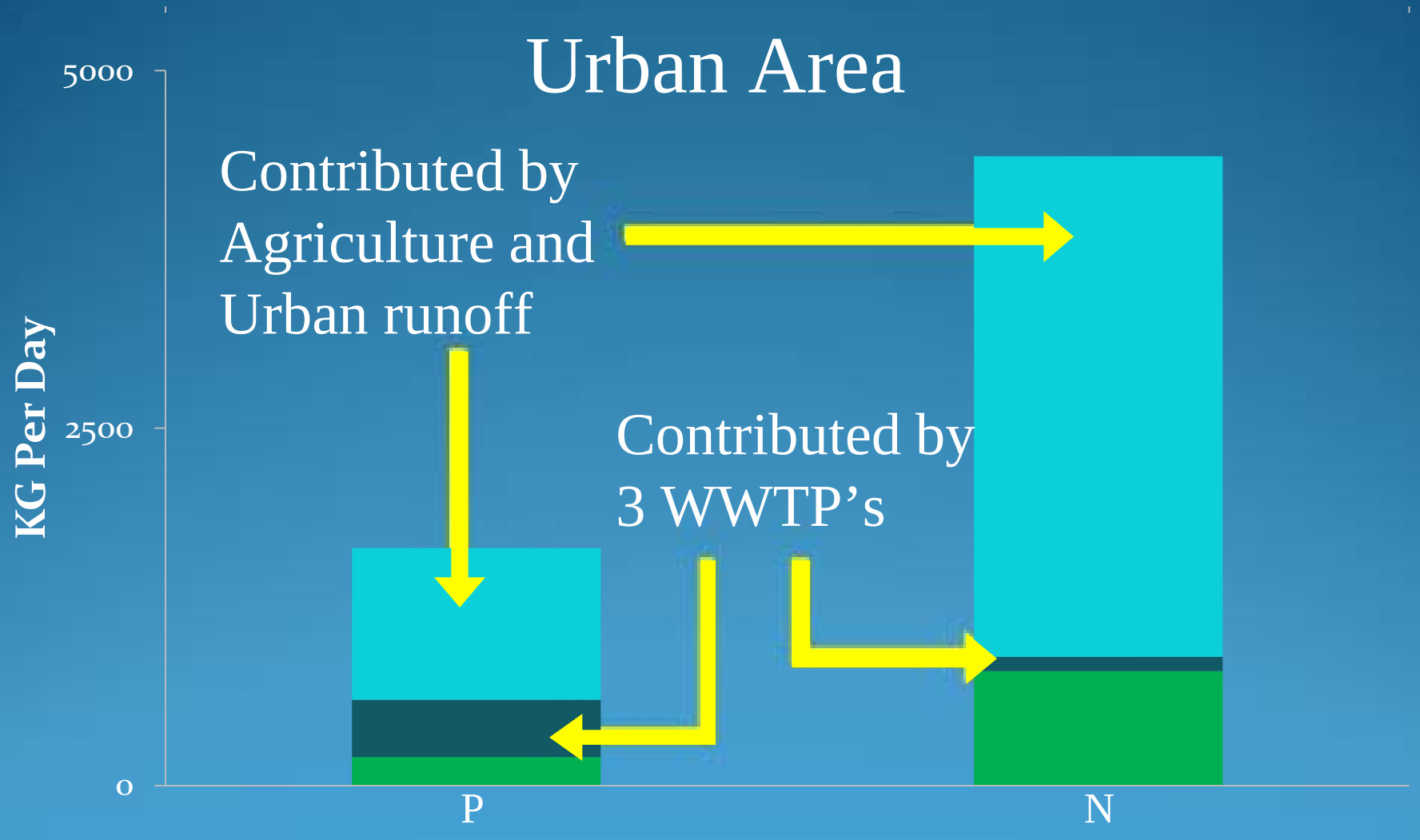
Non-point Sources

- Examples
  - Agriculture runoff
  - Urban runoff
  - Forest and grasslands
- Non-point pollution is often difficult to identify
- Rainfall or snowmelt carry natural and human-made pollutants to the river



http://www.nptwaterresources.org/Non%20Point%20Source.html

Source Contribution



Data from: Son, Ji-Hee, 2013. Nutrient Load Inputs to the Cache La Poudre River and Watersheds. Colorado State University, Spring 2013. Figure 6.6.

Nutrient Pollution Regulations

- Colorado regulates nutrients from point sources such as wastewater treatment plants
  - Non-point sources are largely unregulated
  - Best Management Practices are “encouraged”
- In 2012 interim nutrient limits were adopted (Reg#85)
  - New N & P limits will apply to Greeley in 2017

    Cost: between $6-7 million
  - Boulder estimates $13.5 million to comply
- Future water quality-based regulations will be even more stringent and more expensive

Nutrient Trading Alternative

- Nutrient Trading allows one regulated source to pay another unregulated source to reduce pollution
  - Total nutrient pollution can be reduced at lower costs (hopefully)
- Example, a WWTP pays for “precision agriculture” this could:
  - Reduce the farmer’s application of fertilizer
  - Thus reducing a source of non-point pollution
  - The state would then allow the WWTP to discharge more nitrogen or phosphorous than otherwise

Additional Alternatives

- Total Maximum Daily Limit (basin-wide TMDL) Program applying to both point and non-point sources
  - Requires regulatory revision to make practical
  - Would require cooperation, commitment, socio-economic balance, and lots of time
- Need scientifically-based site-specific variances
- Tiered discharge limits for wastewater plants
  - Based upon both real-time discharge and upstream flow instead of always at 10-year low flow
  - Protective yet flexible

“We cannot solve our problems with the same thinking we used when we created them.”

Albert Einstein