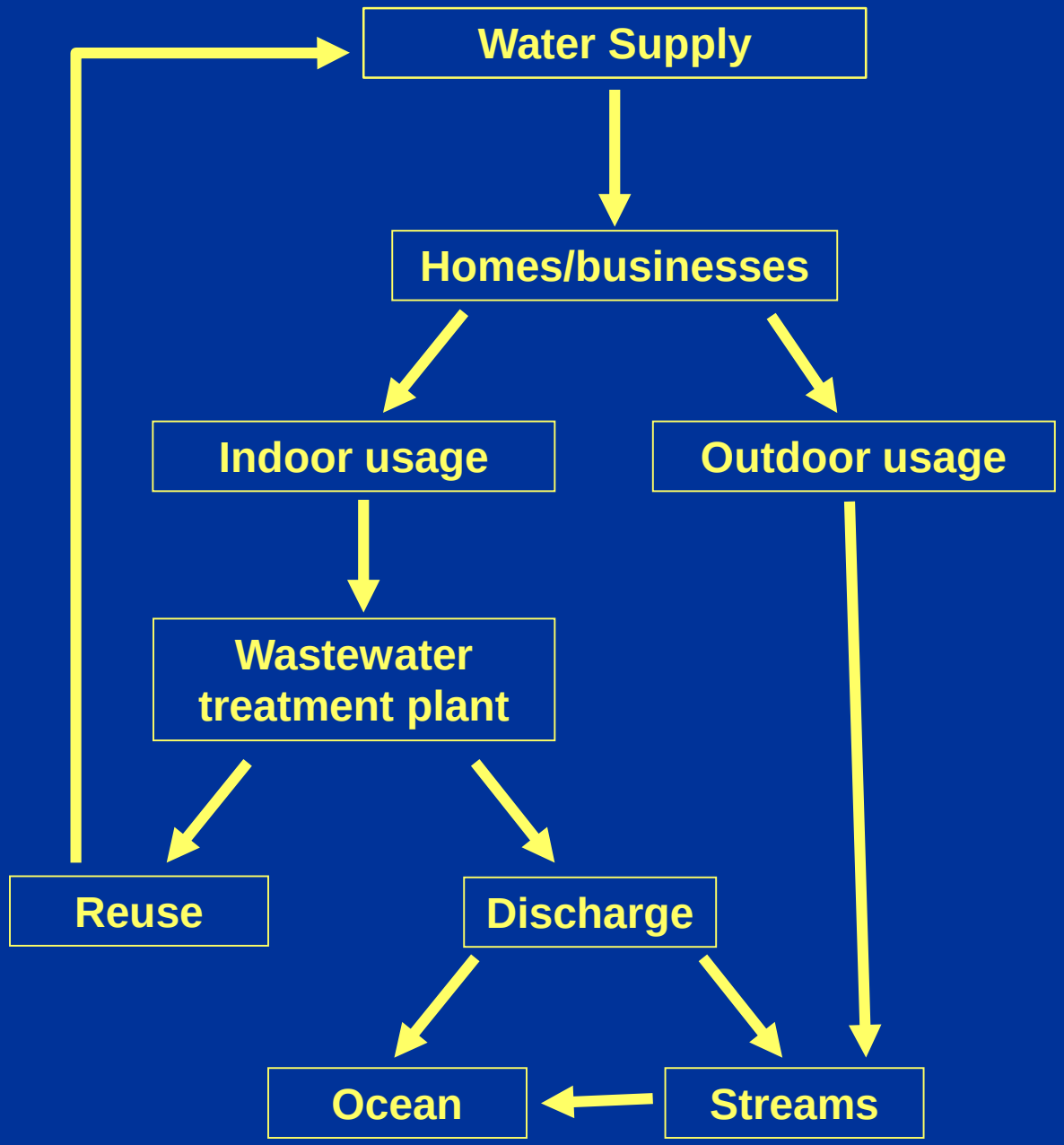
EFFECTS OF DROUGHT ON WASTEWATER TREATMENT OPERATIONS: RESEARCH NEEDS

Presentation to the SCCWRP Commission

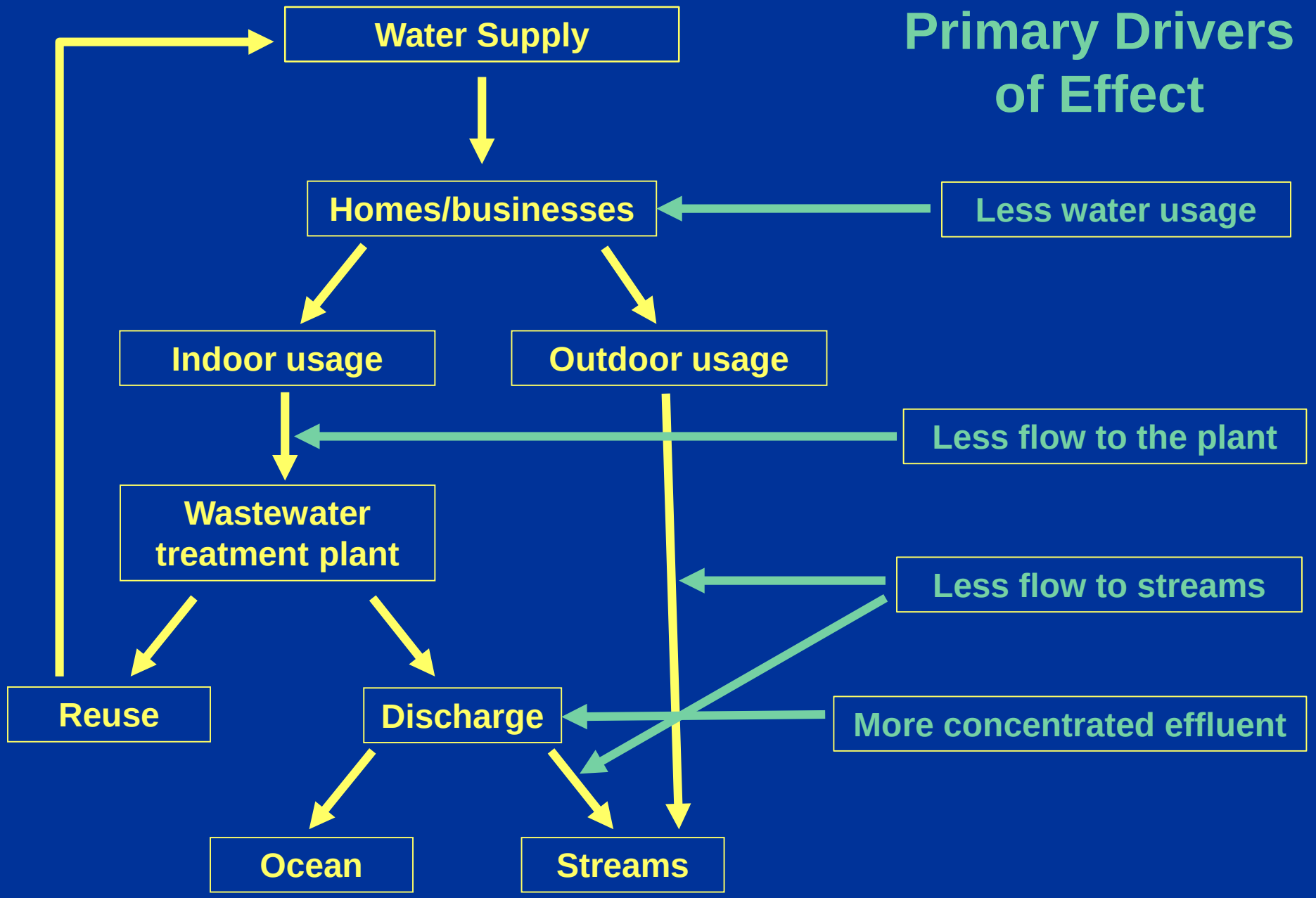
September 9, 2016

BACKGROUND

- **Drought has already affected the mission for many of the SCCWRP member organizations**
  - Increased desire for recapture, recycle and reuse
- **Drought has other more subtle effects on operations**
  - Can change the quantity and quality of both influent and effluent
- **The Commission asked for a presentation summarizing drought effects on treatment plant operations**
  - Also asked for a summary of potential SCCWRP research on this topic


Water Supply
Homes/businesses
Indoor usage
Outdoor usage
Wastewater treatment plant
Reuse
Discharge
Ocean
Streams

Primary Drivers of Effect



POTENTIAL ISSUE: LESS FLOW IN PIPES CAN LEAD TO COLLECTION SYSTEM ISSUES

- **Homeowners and businesses use less water**
  - Outdoor watering restrictions
  - More conscience of water use activities indoors
- **Less flow can result in sedimentation**
  - Sedimentation can lead to pipe corrosion
  - Leakage or spill potential compounded by tree roots seeking more water
- **Management need: More frequent and better monitoring of pipe systems**
- **Research need: How to best conduct that monitoring**
  - An issue not appropriate to SCCWRP's expertise

POTENTIAL ISSUE: CHANGES IN INFLUENT QUALITY

- **As homeowners and businesses cut back on usage, they produce a higher concentration flow**
  - Changes of influent quality can lead to plant inefficiencies or upsets
  - For some operators, change in influent quality may also result from changing freshwater sources
- **Management need: More or different treatment processes**
  - Including process control monitoring
- **Research need: Engineering assessments**
  - Another issue that is not appropriate to SCCWRP's expertise

POTENTIAL ISSUE: INSTREAM FLOW NEEDS

- **Drought leads to less flow in streams and rivers**
  - Less local rainfall
  - Reduced land-based runoff with less outdoor water usage
  - Increased emphasis on reuse leads to less treatment plant ambient discharge
- **Management need: Optimizing stream flow to support biota**
  - Particularly important where endangered species are present
- **Research need: Determining flow requirements for biota**
  - This is an area we are already working and poised to do more
- **Research need: Establishing biotic assessment tools for intermittent or low flow streams**
  - We are a leader and active in this field

POTENTIAL ISSUE: MORE CONCENTRATED EFFLUENT

- **Reuse leads to a similar mass of contaminants in a lesser volume of water**
- **Management need: Understanding whether more/different treatment is needed prior to discharge**
- **Three potential research needs:**
  - Understanding plume behavior
  - Toxicity of concentrated effluent
  - Understanding relative risk between green house gas production for contaminant removal vs. contaminant effects in the ocean

UNDERSTANDING PLUME BEHAVIOR

- **A more concentrated plume leads to a heavier plume**
  - Present diffusers and plume models are based on a buoyant plume
  - Buoyant plumes rise to the thermocline and disperse
  - Heavier plume can lead to more deposition near the outfall
- **SCCWRP has held workshops on this topic**
  - Identified alternative diffuser designs appropriate to a heavier plume
- **Don’t have further plans to work on this issue**
  - Don’t anticipate that reuse options will lead to a negatively buoyant plume
  - Issue becomes more relevant if wastewater treatment becomes linked with desalination operations

TOXICITY OF CONCENTRATED EFFLUENT

- **Research need: Toxicity of concentrated effluent**
  - We are not presently working on this, but this topic aligns well with our expertise
- **CTAG felt this was unlikely to be a big issue**
  - Your plumes are generally not toxic even at full strength
  - The allowable dilution in your mixing zone should still lead to a non-toxic effluent even with reuse leading to a higher concentration
- **Don’t presently have plans to work on this, but we could**
  - However, your labs are well-suited to quantify this

GREEN HOUSE GAS EMISSIONS

- **Effluent regulations are based on concentration limits**
  - Discharge concerns are more focused on mass
  - Concentrations may increase, but mass will be largely unaffected
- **Leads to weighing of competing risks: greenhouse gas production associated with treatment vs. benefits of reduced effluent concentration**
- **Involves a larger view of the problem**
- **Not presently working on this, but the question aligns well with our expertise**
  - Is this something that interests the Commission?