Sustainable Water Resources Management in California: A Planner’s Perspective

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Water and Land Use: why don’t we plan and design them together?

- Fragmented jurisdictions – special districts and agencies involved in water, cities and counties involved in land use
- Vast geographic territory and budget issues
- Different missions and decision-makers
- Different professional cultures and approaches
- Different planning horizons and planning tools
- Fear of each other’s technical black boxes
- Fear of being caught up in the “growth wars”
Is this a land use and does it influence land uses?
No Water, No Farming.
No Farming, No Food.

Central Valley Family Farmers
How can better land use planning linked to water resources help?

- By carefully connecting future growth to water needs means less costly infrastructure, less impact to aquatic resources
- Higher levels of water conservation and reuse means reduced need for additional water, less costly infrastructure and reduced impact on streams, wetlands and ground water
- Connecting water needs with source quality means lower cost and reduced water use (e.g. raw water or recycling for green space and industrial use)
How can better land use planning linked to water resources help?

- Low impact development solutions for stormwater mean easier permitting, reduced water quality impacts and ground water recharge.

- Protection and restoration of reservoirs, watersheds, streams, creeks, drainages, wetlands and ground water recharge areas.

- State funding is increasingly tied to regional collaboration, integrated water resources planning, water conservation performance.

- Education and awareness of the links between land use and water lead to better decision-making and better projects.
What We Learned in School

- Play well with others; share toys (and do it regionally!)
- Learn to count (keep a good water balance sheet)
- Think first, then act (plan considering long term consequences)
- Take care of what we have (conserve, reuse)
- Clean up our messes
- Connect the dots (land use, water, wastewater, habitat, flood control...)

[Image of a drawing related to water management]
At the Regional Level

- Regional water resources collaborations like an Integrated Water Management Plan or more specific like the Sacramento Water Forum

- Regional Land Use and Transportation “Blueprints” going on in numerous regions including Sacramento, San Joaquin Valley, Monterey, San Diego, etc.

- Regional Ground Water Plans

- Watershed Management Plans and Programs
Its members include the counties of El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba as well as their constituent municipal governments.
How to Best Manage Growth?

AMOUNT OF GROWTH
Through 2050

- People: 1.7 Million
- Jobs: 1 Million
- Dwellings: 840,000

Sacramento Area Council of Governments • Valley Vision
Seven principles of smart growth

- Transportation Choices
- Compact Development
- Mixed Land Uses
- Housing Choices
- Use Existing Assets
- Conserve Natural Resources
- Quality Design
Basecase Scenario

Key to the Map
- areas of existing and future development
- green areas (e.g. open space, parks, wetlands, vernal pools, stream corridors, hardwood stands)
- agriculture and other undeveloped lands
- rivers, streams and lakes
- city boundaries
- highways
- county boundaries
Preferred Scenario

Key to the Map
- **Yellow**: areas of existing and future development
- **Green**: green areas (e.g., open space, parks, wetlands, vernal pools, stream corridors, hardwood stands)
- **Light Brown**: agriculture and other undeveloped lands
- **Light Blue**: rivers, streams, and lakes
- **Red**: city boundaries
- **Gray**: highways
- **Beige**: county boundaries
ADDITIONAL URBANIZED LAND
Through 2050
(in square miles)

Base Case Scenario

Draft Preferred Blueprint Scenario

661 sm
304 sm
0 175 350 525 700
## Water Demand Analysis

### Table: Water Demand Analysis

<table>
<thead>
<tr>
<th>Region</th>
<th>Incremental Demand (acre-feet/year)</th>
<th>Demand Per Unit</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residential</strong></td>
<td>661,125</td>
<td>0.86</td>
<td>-38%</td>
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<tr>
<td></td>
<td>408,362</td>
<td>0.50</td>
<td>-42%</td>
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<tr>
<td><strong>Employment</strong></td>
<td>199,817</td>
<td>0.22</td>
<td>-9%</td>
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<td></td>
<td>181,611</td>
<td>0.18</td>
<td>-20%</td>
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<td><strong>Total</strong></td>
<td>860,942</td>
<td>0.50</td>
<td>-31%</td>
</tr>
<tr>
<td></td>
<td>589,973</td>
<td>0.18</td>
<td>-31%</td>
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DWR’s “Pyramid of a Successful Water Future: Integrated Regional Water Management Plans

Vision

Initiatives
Ensure Reliable Water Supplies

Foundational Actions
Ensure Sustainable Water Uses

Implement Integrated Regional Water Management

Vital Economy
Healthy Environment
High Standard of Living

Improve Statewide Water Management Systems

Use Water Efficiently

Protect Water Quality

Support Environmental Stewardship
Sacramento Water Forum: watershed scale focus on water supply and ecological restoration

Jeff Loux
Center for Collaborative Policy and UC Davis Extension
The Water Forum includes the entire American River Watershed (and even touches the Cosumnes River watershed).
But the lower American River is the focus of the plan.
What Are the Problems the Water Forum was set up to solve?

- The lower American River habitat needs improvement and its aquatic resources are not protected by an adequate flow standard.
- The region is growing rapidly and needs additional surface and ground water to meet increasing demand and reliability.
- Local aquifers are experiencing stress and contamination.
- The agencies and stakeholders were in various lawsuits for 25 years; they were fragmented and could not work together.
Who are the Water Forum Stakeholders?
40 STAKEHOLDER SIGNATORIES:

Water

- Arden-Cordova Water District
- Cal American Water Co.
- Carmichael Water District
- Citrus Heights W.D.
- City of Folsom
- City of Roseville
- Clay Water District
- Del Paso Manor Co. W.D.
- El Dorado County W.D.
- El Dorado Irrigation District
- Fair Oaks W.D.
- Florin County W.D.
- Galt Irrigation District
- Georgetown Divide P.U.D.
- Natomas Mutual Water Company
- Omochumne-Hartnell W.D.
- Orange Vale Water Co.
- Placer County W.A.

- Rancho Murieta C.S.D.
- Regional Water Authority
- Rio Linda/Elverta W.D.
- Sacramento Suburban W.D.
- Sacramento County Farm Bureau
- San Juan W.D.

Environment

- Environmental Council of Sacramento
- Friends of the River
- Save the American River
- Sierra Club Motherlode Chapter

Public

- City of Sacramento
- County of Sacramento
- League of Women Voters
- Sacramento County Taxpayers League
- Sacramento Co. Alliance of Neighborhoods
- Sacramento Municipal Utility District

Business

- Associated General Contractors
- AKT Development
- Building Industry Assn.
- Sacramento Assoc. of Realtors
- Sacramento Metro. Chamber of Commerce
- Sac Sierra Bldg/Construction Trade Council
The Water Forum Way: Interest-Based Collaboration

- 40+ signatories and many other “partners”
- 4 primary “interest-based” caucuses: business, environmental, water supply and public
- Year 2000: historic detailed agreement followed by on-going Successor Effort
Two Coequal Objectives Agreed Upon Early and Referred to Often
Provide a reliable and safe water supply for the region’s economic health and planned development through the year 2030.
Preserve and enhance the fishery, wildlife, recreation, and aesthetic values of the Lower American River.
Water Forum Agreement -
Seven Integrated Elements
Each Linked and Interdependent on the Others
Increased Surface Water Diversions
Actions to Meet Customers’ Needs While Reducing Diversion Impacts in Drier Years
An Improved Pattern of Fishery Flow Releases From Folsom Reservoir
Lower American River Habitat Management
Based on CDFG data since 1952, the population of LAR Chinook salmon on average has accounted for nearly 17 percent of the estimated total annual number of salmon spawning in the Central Valley.

Source: California Department of Fish and Game; estimates for 2001–2003 are preliminary.
Cosumnes River Watershed Protection

- Negotiated with County, three ag water districts, environmentalists and Nature Conservancy
- Provide water supply to “pre-wet” the dewatered channel in low flow times (late fall)
- Water to come from Aerojet remediated ground water
- Supports conjunctive use, agriculture, riparian habitat, fisheries and water quality goals
It's not hip to drip.
Groundwater Management
Sustainable Yield = 131,000 AF

Sustainable Yield = 273,000 AF

Sustainable Yield = 115,000 AF
Conjunctive Use of Surface and Groundwater

WATER DEMANDS

YEAR TYPE

Wet
Above Normal
Below Normal
Dry
Dry following Critical

Surface Supply

Groundwater

Safe Yield

Increased Pumping

Critical
Water Forum Successor Effort: continue collaboration and working together
WATER FORUM: A FEW TANGIBLE ACCOMPLISHMENTS

- Expansion of Five Water Treatment Plants and Intakes
- Groundwater Management Plans and Governance
- Removed the pumps at Auburn and river restoration
- $30 million in state and federal funds for environmental, water and ground water projects
- Approval for Freeport Water Intake facility and County Water master plan for conjunctive use
- Influenced other collaboratives such as the Yuba River Accord
- Begun to address the ground water contamination problems on a regional basis
- Assisted in restoration of surface water sources for the neighboring Cosumnes River
Groundwater Management Plans: AB 3030, SB 1938 and recent legislation

- Regional programs for monitoring and managing groundwater
- Over 100 agencies, districts, cities and counties have plans (many in the Central Valley)
- e.g. Turlock area includes 14 agencies, 3 cities and 2 counties
Required Components of Groundwater Management Plans

**Required Elements**
- Public participation
- Basin objectives
- Monitoring and management of water levels, quality, subsidence, surface flow changes, water quality changes
- Plan to involve other agencies

- Monitoring program to track data to meet objectives
- Map of the basin and any local agency boundaries
- Can levee assessments, but cannot require limitations in pumping
- New law requires local or regional ground water monitoring and reporting
Types of Policy/Management Issues: Groundwater Management Plans

- Control of salt water intrusion
- Management of wellhead protection and recharge areas
- Regulate migration of contaminated groundwater
- Well abandonment program
- Mitigation of overdraft
- Replenishment of groundwater
- Facilitate conjunctive use operations
- Monitor groundwater (levels of storage)
- Well construction policies
- Construct and operate clean-up, recharge, storage, conservation, recycling, and extraction projects
- Review of land use plans and coordination with land use agencies
Comprehensive Watershed Planning, Management and Implementation
Watershed Management Planning: Free Ecosystem Functions and Services from the Watershed

1. Flood water storage
2. Water quality filtering
3. Habitat for many species (floodplains are often essential to juvenile fish)
4. Soil deposition and nutrient cycling; farming value
5. Water supply
6. Rivers are the water supply infrastructure (conveyance)
7. Recreation and aesthetics
8. Ground water recharge
9. Sediment transport and deposition
The Effect of Urbanization on the Natural Drainage Network in the Four Mile Run Watershed

1917, Pre-Urbanization

1998, Post Urbanization

Pond

Over 35 miles of natural drainage were replaced by storm sewers.
A River?
Napa River Watershed Plan:
Working together to solve problems

Before

After
What can be done at the City, Community or General Plan Level
General Plans: Addressing Water

- Required for all cities and counties – 7 elements
- Constitution for growth and conservation
- Develop GP land use map alternatives that address water resources issues directly
- Determine “where you grow”
- Determine “how you grow”
- Incorporate water management policies in the GP
- Analyze water issues carefully in the EIR
- Develop a Water Element as part of the GP or in Conservation or Public Facilities Element
Example of Determining How Much to Grow and Where: Santa Barbara’s General Plan Process Addressing Water Supply
DEVELOPMENT POTENTIAL

Alternative C
Complex and Integrated Portfolio Water Management Means Careful Water Accounting (The Water Balance)
Need for Accurate Demand Estimates and Projections

- Long range supply planning
- System facilities sizing and scheduling
- Revenue forecasts for rate studies
- Conservation and recycling planning
- Meeting the tests of water/land use laws like 221 and 610
- Other land use and infrastructure planning like wastewater
- Being as careful as we can with water
Land Use Approach

1. Determine Land Use Categories
2. Develop Existing Polygons
3. Develop Future Polygons within SOI
4. Identify Unique Water Users
5. Phase Future Polygons
6. Apply Unit Demands to Land Use Polygons
7. Develop Unit Demands from Consumption Data
8. Adjust to Reflect Density Ranges
9. Modify to Reflect Future Conservation

WATER DEMANDS
Use Same Land Use Data Base for Water, Land Use, Wastewater, Habitat Conservation, Transportation...
GIS Layers Needed for Demand Estimating

- Nodal Polygons
- Increased Densities
- General Plan Land Uses
- Existing Land Uses
- Boundaries
- Base Map

- Hydraulic Model Pipe Nodes
- Selected Demand Nodes
- Redevelopment
- Infill
- Mixed Uses
- TODs
- Planned Land Use Designations
- Phase in 5 Year Increments
- Actual Residential Densities
- Irrigated Park
- Industrial Grouped by Water Use
- City Limits or Service Area
- Sphere of Influence
- Study Area
- Pressure Zones

- Streets
- Parcels
- Pipes
Example of Demand Calculation Tool

**EXAMPLE:** Polygon 5 is located within Subarea G1 (Central pressure zone) and contains several meters. It is 2 acres classified as EC, existing commercial. It is classified as EC for years 2000, 2005, 2010 but changes to FMU, future mixed uses, in years 2020 and 2030 as the street it is located on gentrifies into transit oriented mixed use developments with higher densities. Polygon 5’s 1996 water demands were 3600 gpd; its normalized LUD is 1990gpd/ac. Multiplying a future LUD from the lookup table for a specific year, by the number of acres from the shape file, a projected water demand can be calculated and stored in a .dbf file for each year. Each of the polygons are summed within the Demands Calculation Tool to generate the total projected water demand for that year.

<table>
<thead>
<tr>
<th>POLYGON 5</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
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<tr>
<td>Land Use</td>
<td>EC</td>
<td>EC</td>
<td>EC</td>
<td>FMU</td>
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<tr>
<td>LUD (gpd/ac)</td>
<td>1930</td>
<td>1980</td>
<td>2040</td>
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<tr>
<td>Acreage</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>DEMAND (gpd)</td>
<td>3860</td>
<td>3960</td>
<td>4080</td>
<td>5600</td>
<td>5600</td>
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Figure 4-1
Example of Demands Calculation Tool
Urban Water Management Plans
Urban Water Management Plans: What’s in them?

1. Plan Adoption, Participation, and Coordination
2. History of Growth, Existing Water Facilities
3. Past, Current, Projected Water Supply (including groundwater and water quality) in 5-year increments, average, dry and 3 year worst case
4. Past, Current, Projected Water Use
5. Water Conservation Programs
6. Water Shortage Contingency Analysis
7. Recycled Water, Transfers, Conjunctive Use

8. Excellent tool for 221, 610 and CEQA Reviews
The Form and Location of New Development and Redevelopment has a lot to do with Water Resources
Water demand, cost of infrastructure and service, water quality, economies of scale for wastewater and water, drainage and runoff
“Infrastructure Nightmare”
Development Patterns
Development Patterns
Create a water element for your general plan

- Combine all of the hydrologic cycle into one element
- Incorporate new water supply requirements by including local water purveyors plans
- Incorporate wastewater and recycling plans to locate demand sites
- Incorporate stream and wetland protection, as well as retention drainage policies to address water quality and recharge issues
- Sonoma County, Calaveras County, and Yolo County examples
Contents of a Water Element

- Water supply/demand
- Water quality/wastewater treatment
- Storm Water Management
- Flood Risk Reduction
- Watershed Management
- Protection of Aquatic Resources
Benefits of a Water Element

- Accessible information for the public in one readable document
- Use same database, assumptions and projections for all water infrastructure
- Find linkages between water use, conservation, recycling, wastewater, and drainage
- Assist in storm water and related quality permits
- Promote watershed management approach
Specific Plans, Community Plans & Major Projects

- Hydrologic cycle as a major organizing principal
- Water Supply Management as part of project
  - Intensive Water Supply/ Demand Analysis
  - Increased recycled water use
  - Increased levels of conservation, grey water, storm water
- Creative infrastructure standards
- Creative financing options
- Physical Design Standards
  - Modify project – change mix of land uses, change location of land uses, change densities, change landscape features or design
  - Aquifer recharge zoning
  - Riparian setbacks/protection
  - Retention and drainage facility standards (multi-use)
  - Restoration of channels, wetlands, etc.
  - Low Impact development: bio-retention, pervious surfacing, parking lot design
MORE WATER FASTER
Urban growth changes the way rain runs to rivers and streams

**Developed landscape**
- Rain pours more quickly off cities and suburbs
- Pavement and rooftops shed water
- Streets act as streams
- Drains deliver water directly to rivers
- Runoff peaks more quickly and at a higher volume

**Natural Landscape**
- Grass, trees, brush, and soil help soak up rain and slow runoff
- Trees break the momentum of raindrops pelting the ground so there is less erosion
- Indentations in the landscape pool water
- Vegetation helps build organic, absorbent soil
- Tree roots anchor the soil
- Runoff peaks more slowly and at a lower volume

*Average river height*
Soquel Village Specific Plan, Santa Cruz County
SOQUEL CREEK NORTH FOOTBRIDGE AT WALNUT ST.
HOW HIGH POINT DRAINAGE WORKS TO RECHARGE OUR GROUNDWATER AND PROTECT THE CREEK

**HOUSES** use different strategies to collect, infiltrate, and cleanse rainwater.
- splashblocks
- rocks
- furrows or channels
- stormwater pop-ups
- planted depressions (raingardens)
- yard drains

**STREETS** slope to one side and cut in curb direct rainwater into planted and grass swales.

**SWALES** collect, absorb, and filter rainwater from streets and houses into the ground before going into the city storm drain.

**CONVEYANCE FURROWS** direct water away from the house via a path of gravel and crushed rock.

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**slotted pipes** enable water to seep into the ground while moving away from the house and into the rain garden.

**stormwater pop-ups** release water into the yard.

**stormwater flows across sidewalks toward swales.**

**swales are designed with crossing points.**

32nd Street north of Raymond Street is porous concrete to allow water to pass through into the ground before it goes to the swale.

**city storm drain** to carry bigger rainstorms to the large pond which slowly releases cleaner stormwater to Longfellow Creek.

**porous concrete sidewalks** allow water to pass through into the ground.

**yard drains** direct rainwater to swales or a pipe.

**splash blocks** slow and direct water away from the house and should be kept clean of leaves.

**filter soil mix** includes slotted pipe (underdrain).

**rocky soil** holds water until it seeps into the pipe.
“Green” Road Standards
Green Street Projects
Water Conservation: what can planners do?

- Most of the “easy” stuff is already happening like efficient plumbing
- Ways we can further “squeeze the sponge”
  - Ensure full implementation of established Best Management Practices
  - Compact Growth, Sustainable Design
  - Landscape Water Savings!
  - Recycled water
  - Extra-ordinary “green” building approaches like rain water capture and gray water
  - Storm water retention (LID)
“Above and Beyond”: Water Conservation becomes a collaborative institutional issue between land use and water agencies.
Apply a holistic approach to landscape and site design, construction and maintenance.