Alder Creek Watershed Management Plan

Watershed Assessment

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Alder Creek Watershed Assessment

- Purpose
- Approach / Methods
- Results
- Primary Issues and Considerations
- Recommendations

Purpose

- Watershed Assessment and Management
  - Initial description and assessment of conditions
  - Characterize the magnitude of impairment / disturbance
  - Assisting in the diagnosis of causes to impairment (e.g., sedimentation, contaminants)
  - Predictive assessment
  - Provide recommendations for preservation, conservation, and restoration

Hydrogeomorphic Assessment Approach / Methods

- Characterize existing channel conditions and channel stability on the main stem and major tributaries of Alder Creek

- Identify historical changes and trends in channel pattern, morphology, and bed and bank stability

- Evaluate existing hydrologic models, identify gaps, and develop additional hydrology for pre- and post-project conditions, if necessary

Hydrogeomorphic Assessment Approach / Methods

- Field Work – Collect cross-section surveys, bed and bank material characteristics, and document morphologic features at key geomorphic index points

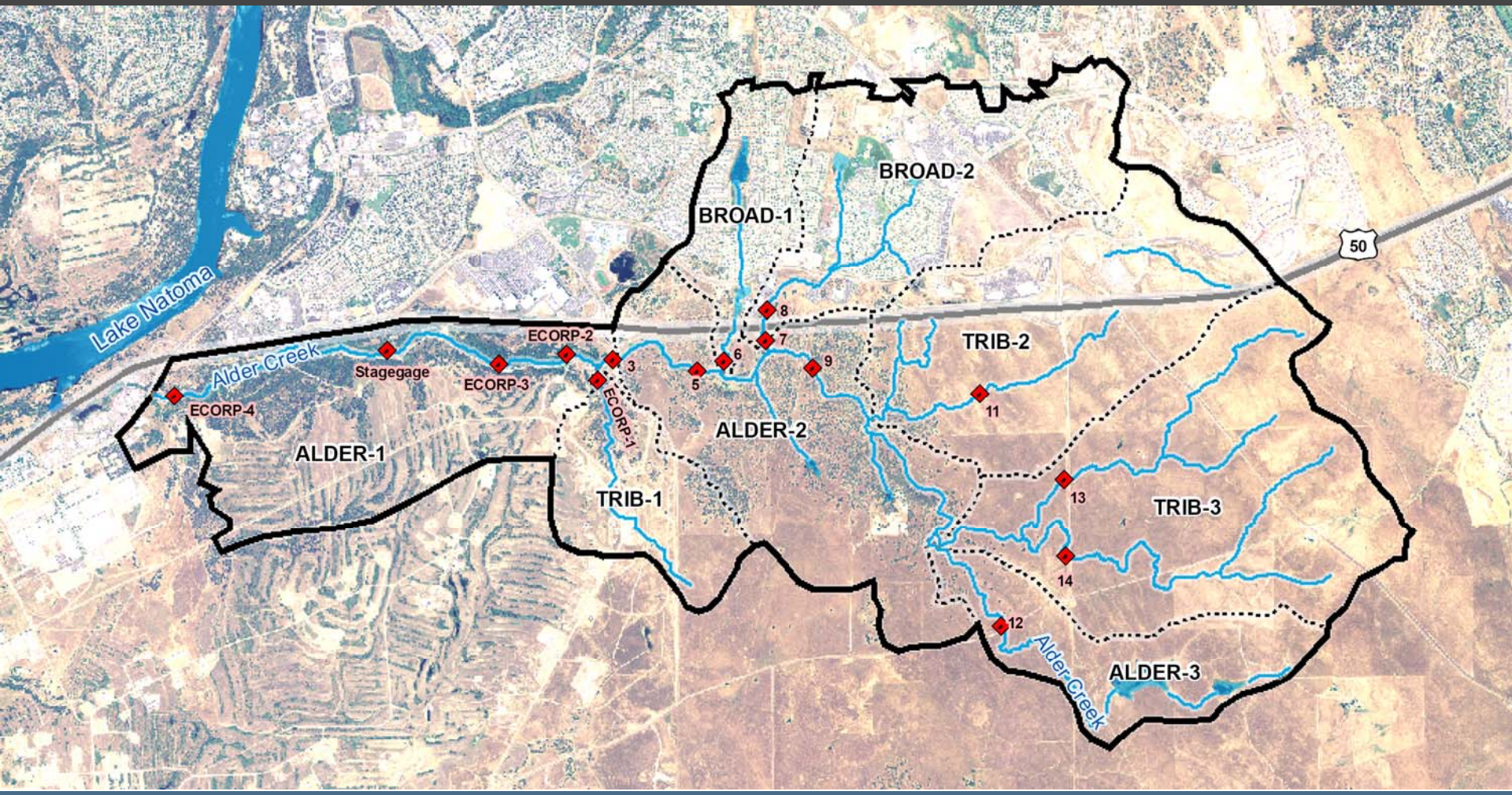
- Identify hydromodification impacts on instream channel stability and sediment transport for post-development hydrologic conditions

Hydrogeomorphic Assessment Approach / Methods

- Identify and characterize the susceptibility of stream reaches to erode and become unstable in response to proposed (build-out) changes in hydrologic conditions

- Summarize findings and provide recommendations for design and development in the watershed that addresses habitat and water quality concerns

Geomorphic Reference Points



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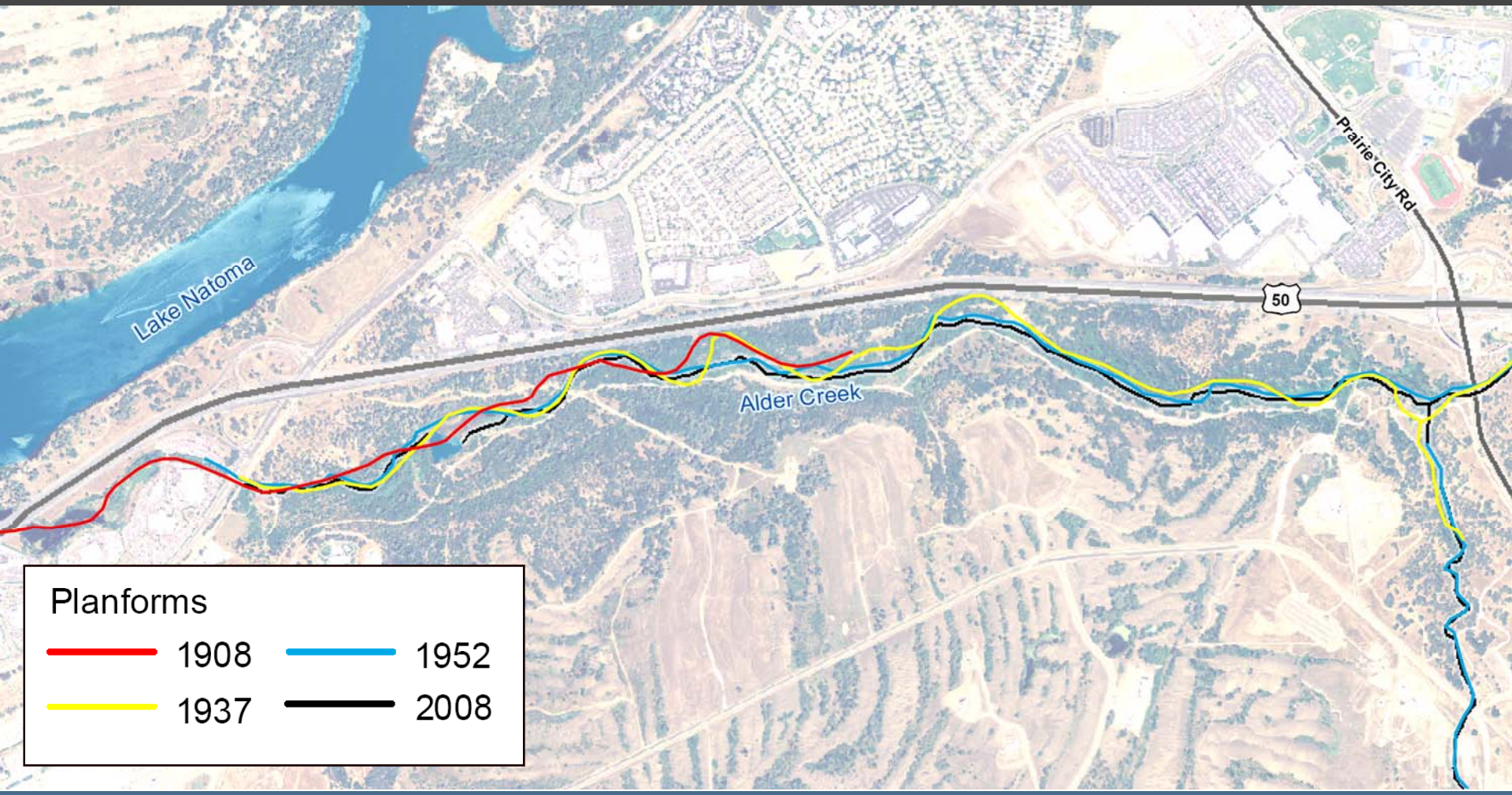
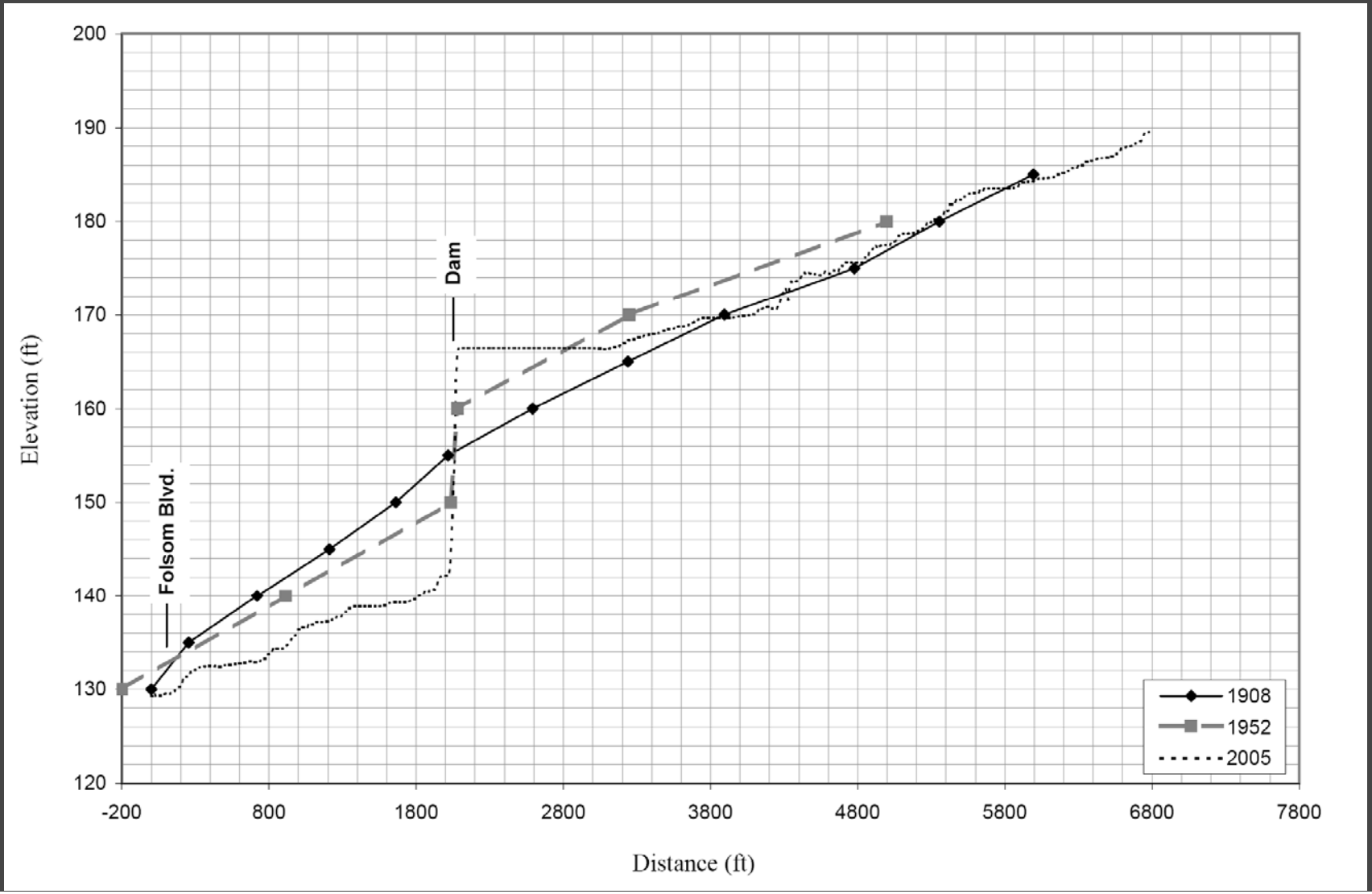
Historical Planform

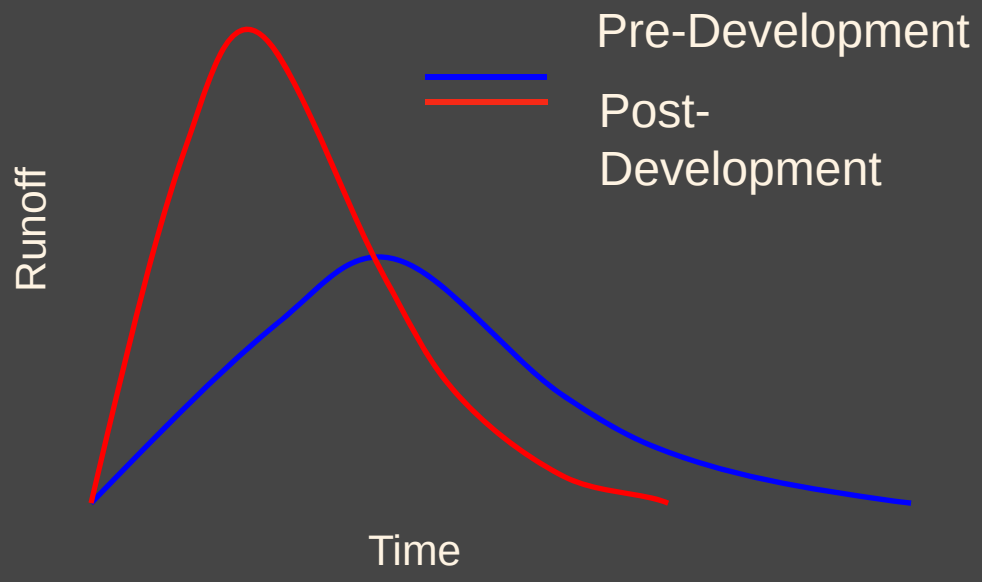


Historical Channel Profiles



Hydromodification

- Urbanization-related changes stormwater runoff and erosion potential
  - Increased runoff volume and peak flow rates
  - Reduced time lag to peak flow
  - Increased frequency of flow events

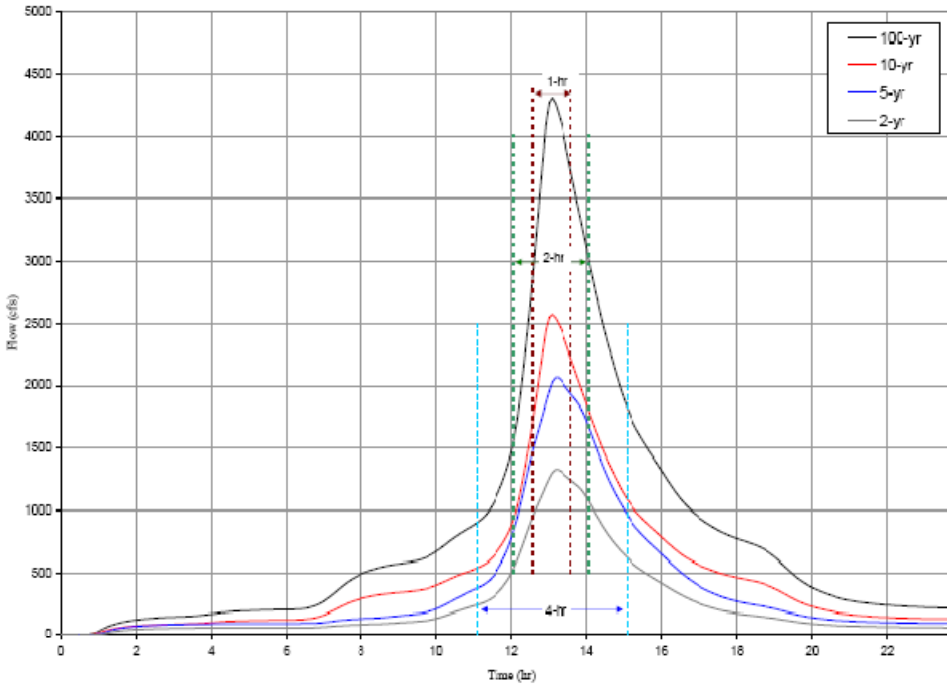


Hydromodification Assessment

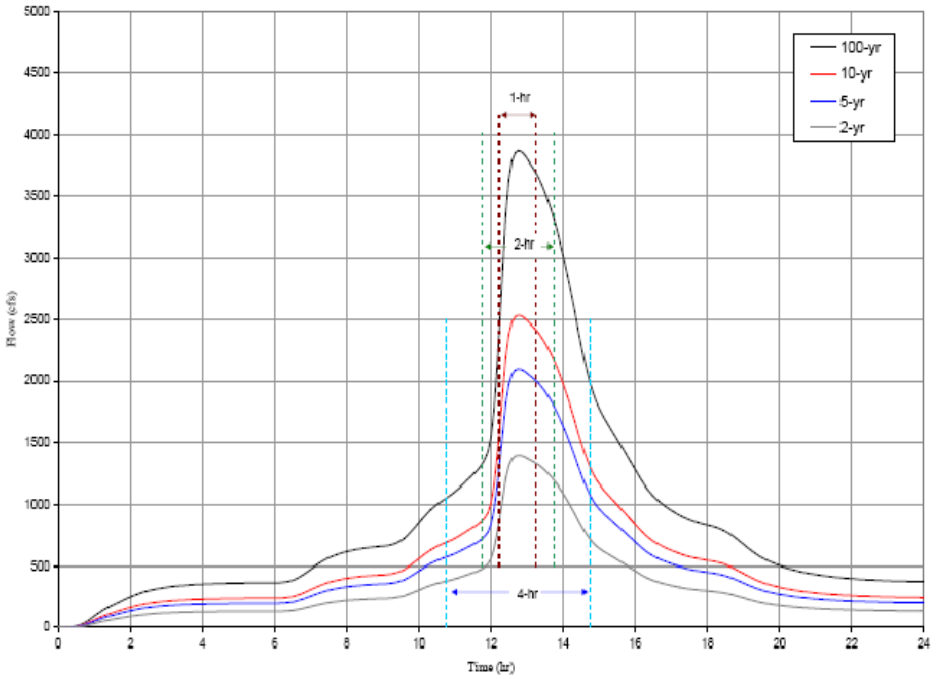
- Hydrologic analysis based on model simulations
- Monthly base flow hydrology developed based on regional analysis of similar valley foothill watersheds, adjusted for elevation and mean annual precipitation (18 gage sites).
- Hydraulic parameters calculated over full range of flows
- Developed discharge-, velocity-, and shear stress – duration curves for each index point
- Shear Stress and Shear Stress Index of Existing and Proposed conditions

Hydrologic Analysis

» Developed existing and project condition for 2 thru 100 year flood hydrographs



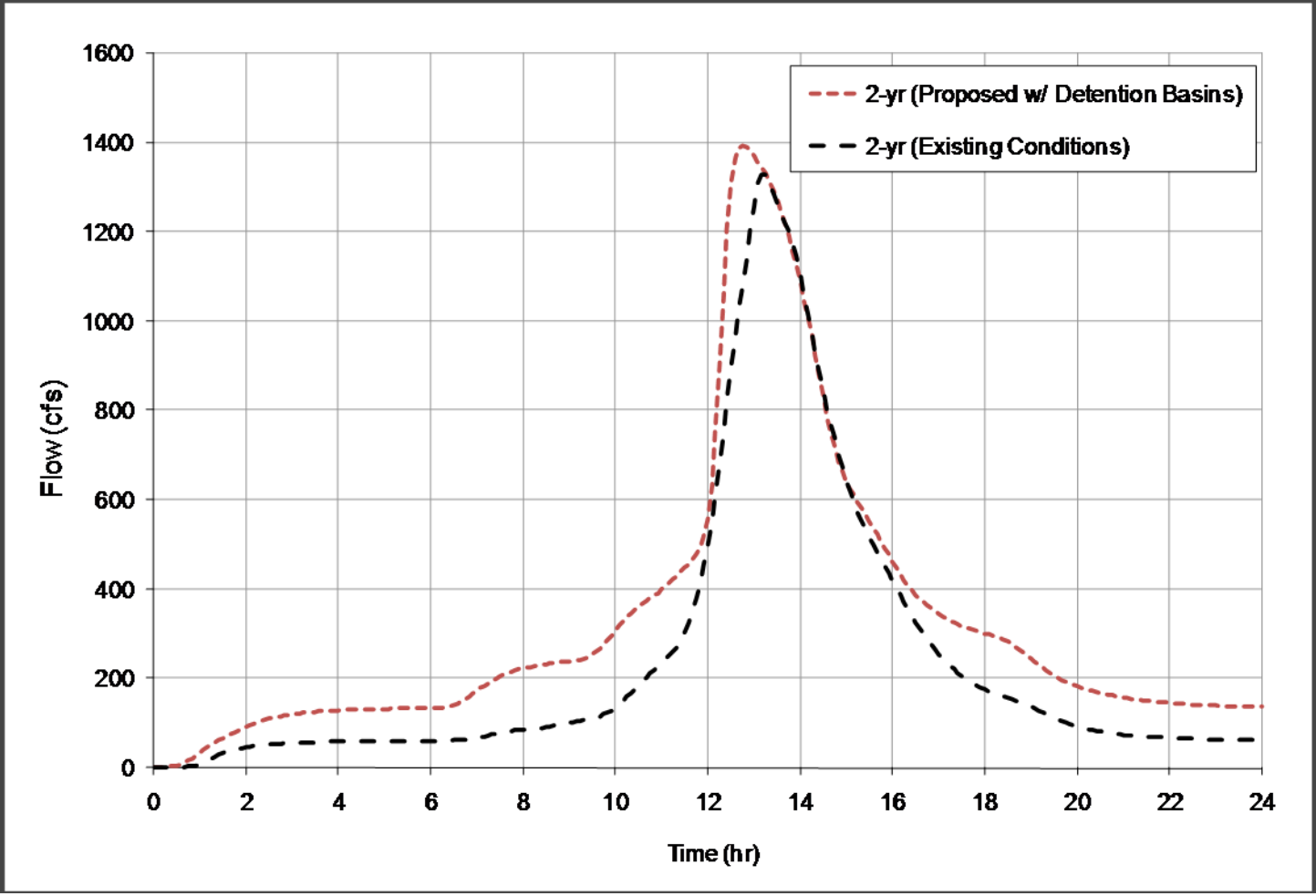
Existing Condition



Proposed Condition w/ Detention

Hydrologic Analysis

» Existing and project condition for 2 year flood hydrographs



Geomorphic Effects of Hydromodification

Shear Stress Index Results		
Geomorphic Index Point	**Shear Stress Index Ratio**	**% Increase**
Stagegage	1.27	27%
ECORP-2	1.30	30%
6	1.61	61%
7	1.01	1%
9	1.22	22%
14	1.58	58%
Source: NHC 2009		

» Shear Stress Index Ratio = Non-dimensional changes in shear stress applied over a range of hydrologic conditions for both existing and modified watershed conditions.

Limitations

- Ideally flow duration curves are developed from continuous flow data over a period of record or from continuous simulation model results
- Flow duration curves were developed based on storm event hydrographs and monthly averaged flow data of similar watersheds
- Continuous simulation hydrologic modeling could confirm the findings of the analytical approach utilized in this analysis, and further evaluate the ability of proposed retention and infiltration facilities for minimizing changes in the continuous flow regime

Summary of Hydrogeomorphic Findings

- Shallow soils, prevalence of exposed bedrock, and the now filled with sediment Natoma Company Dam profoundly influence the hydrologic regime and channel morphology of Alder Creek
- Bedrock and coarse bed and bank materials limits the susceptibility to vertical instability within much of the presently undeveloped watershed
- Extensive bank and floodplain vegetation in lowermost reaches
- Reaches with limited vegetation and finer grained bank materials may be susceptible to channel widening

Summary of Hydrogeomorphic Findings

Questions or Comments…

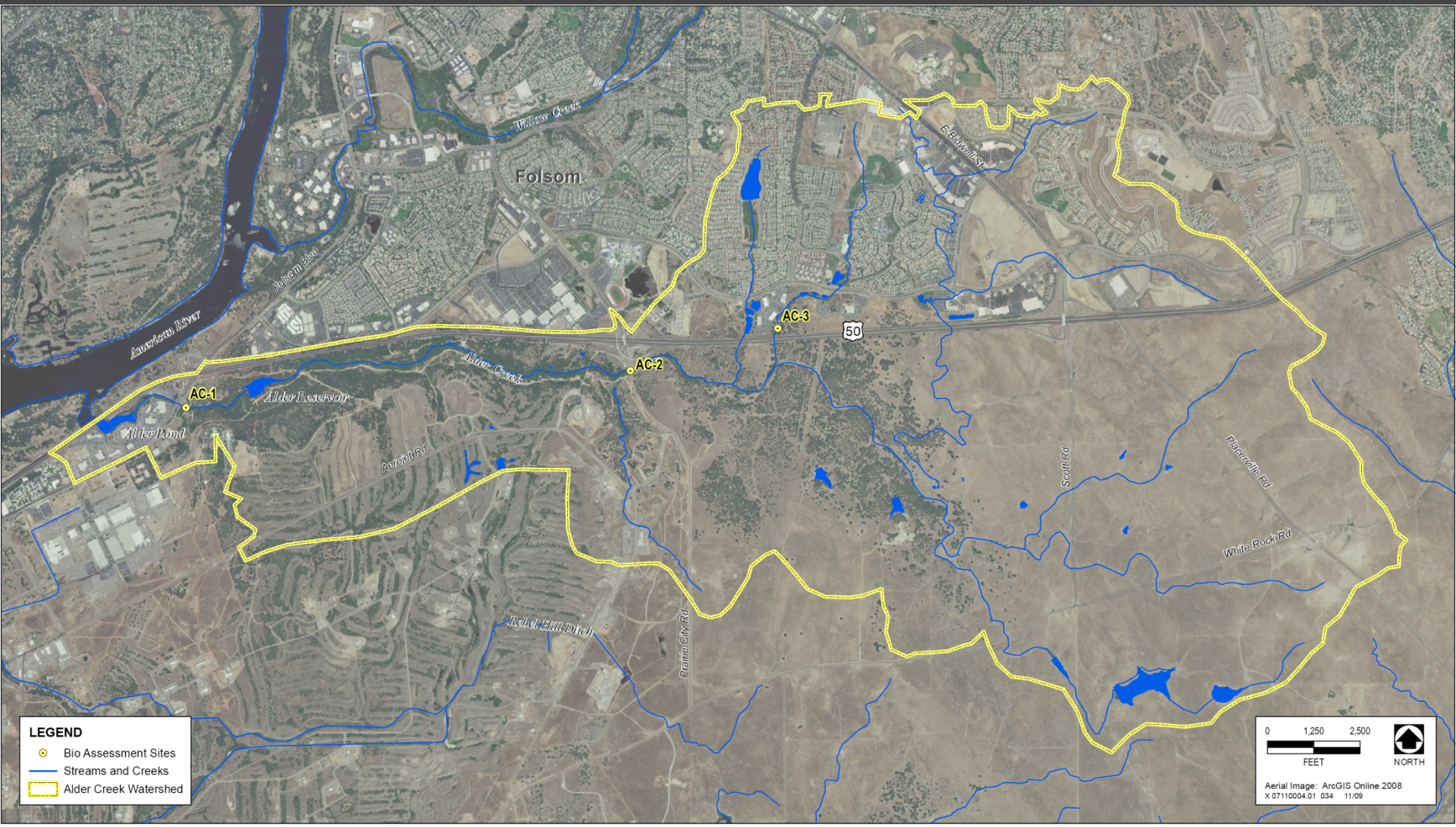
Ecological Assessment Approach / Methods

- Review of Existing Study Reports
  - Surveys
  - Resource assessments
  - Plans
- Analysis and inventory of land cover types and resources
  - Sensitive resources
  - Vegetation communities / habitat types
  - Common plants and wildlife
  - Special-status species

Ecological Assessment Approach / Methods

- Field Data Collection
  - Reconnaissance field surveys
  - Aquatic ecological bioassessment
  - Rapid vegetation assessment

Bioassessment Site Selection



Ecological Assessment Results

- Wetlands and waters
  - Perennial and ephemeral streams
  - Wetlands
  - Vernal pools / swales
  - Seeps
  - Ponds
- Oak woodland / savannah
- Grassland – dominated by annuals
- Vernal pools / swales
- Special-status species
  - Swainson's hawk and other raptors
  - Vernal pool crustaceans
  - Pond turtle

Results – Habitats / Vegetation Communities

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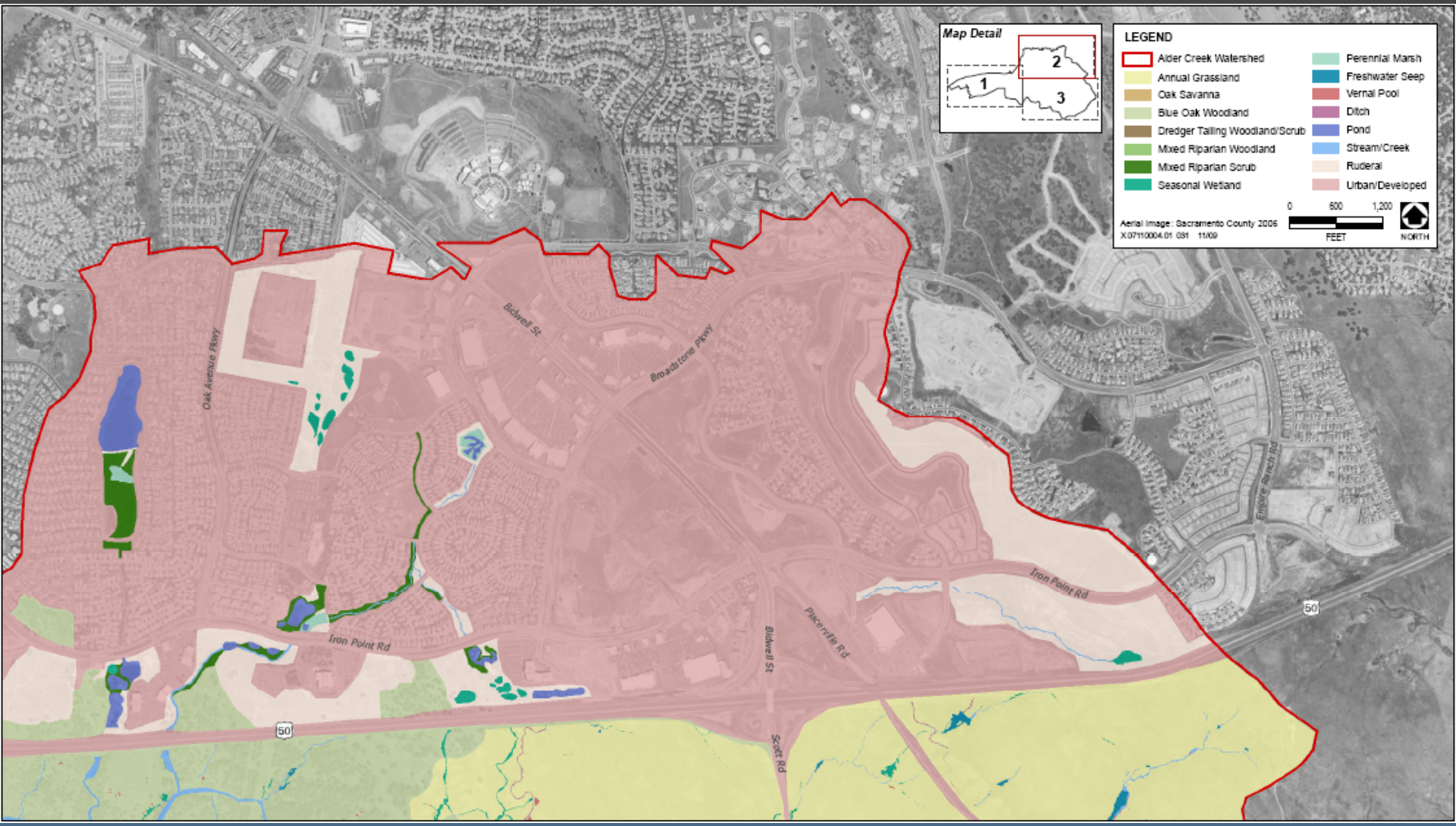

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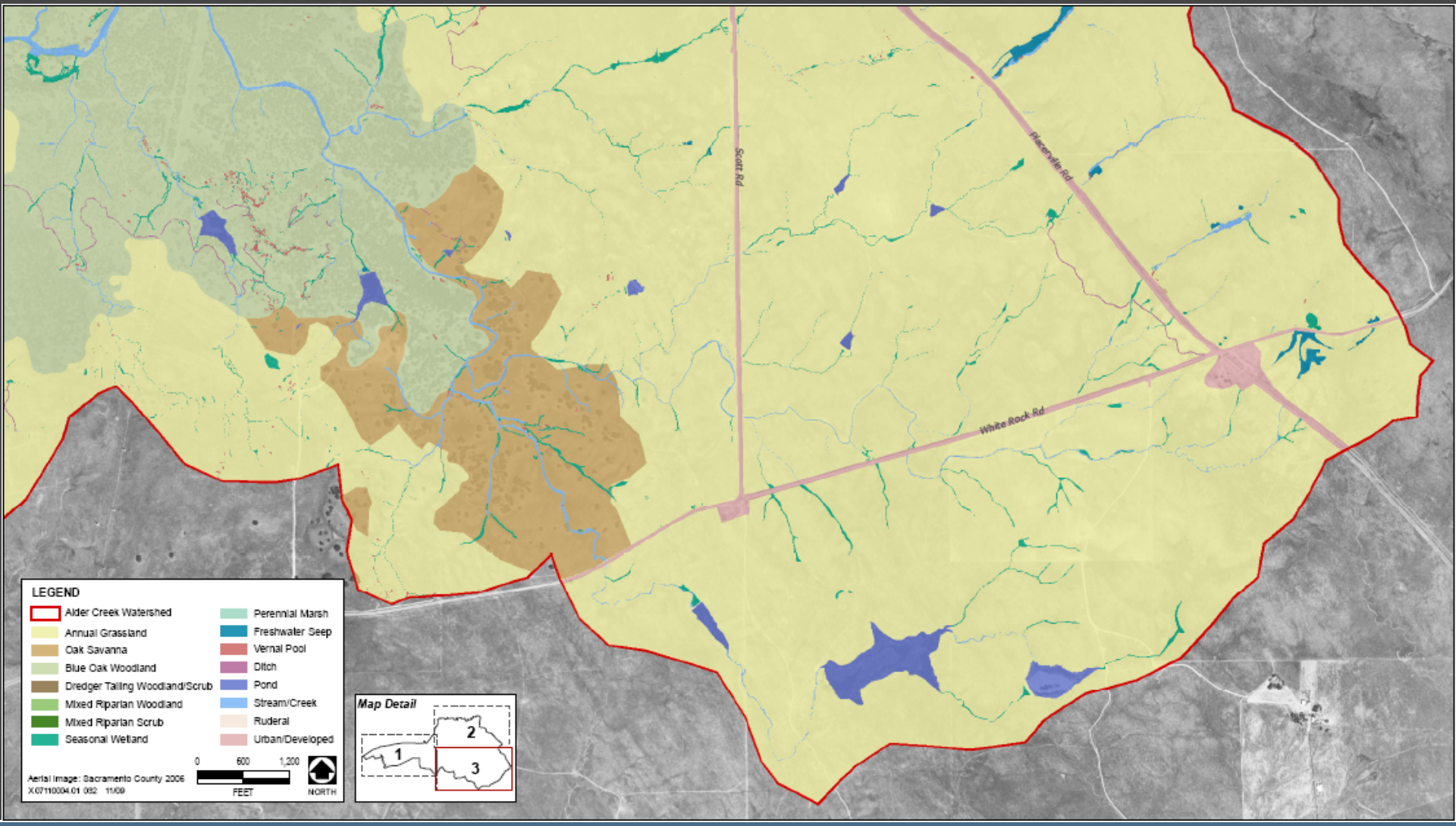


Results – Legacy Mining / Contamination

Results - Bioassessment

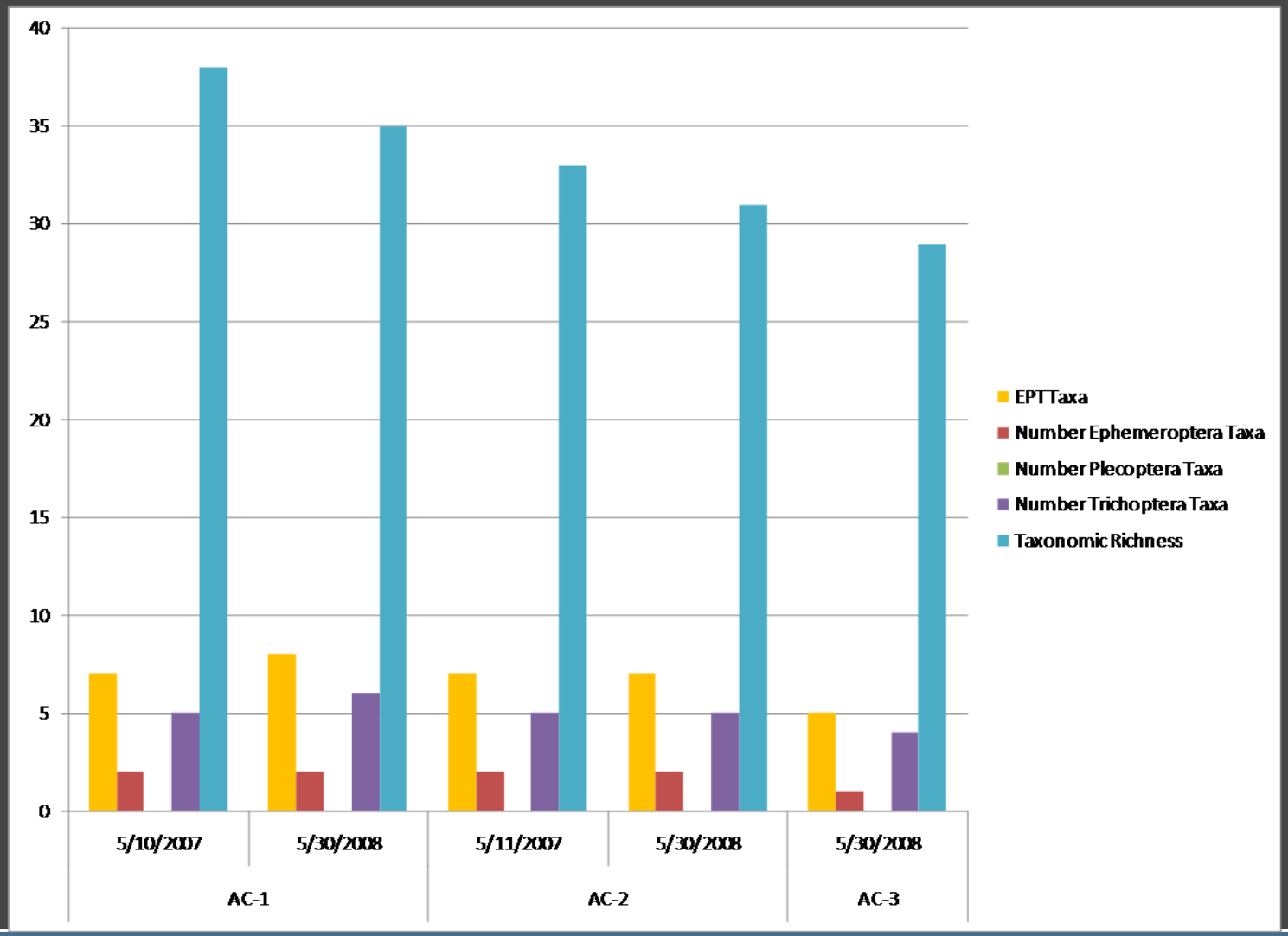
- Physical Habitat
  - Low to moderate gradient foothill stream with riffle, pool, glide, complex
  - Abundant woody debris
  - Cobble, gravel dominated substrate

- Water Quality
  - Field water quality parameters were all within expected range

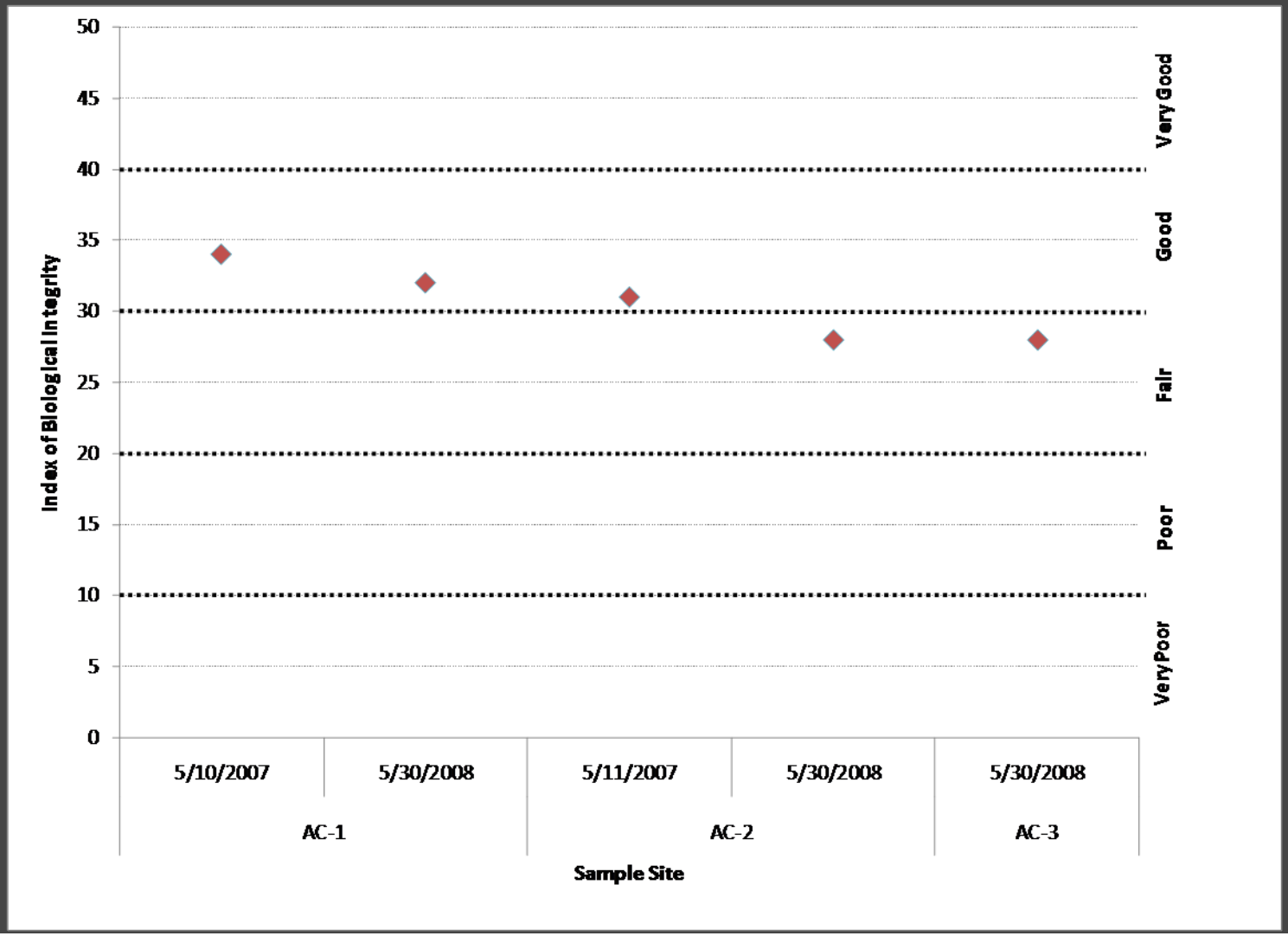
Results - Bioassessment

- Benthic Macroinvertebrates
  - High abundance of organisms
  - High diversity of sensitive and tolerant organisms
  - Results generally indicate good overall health

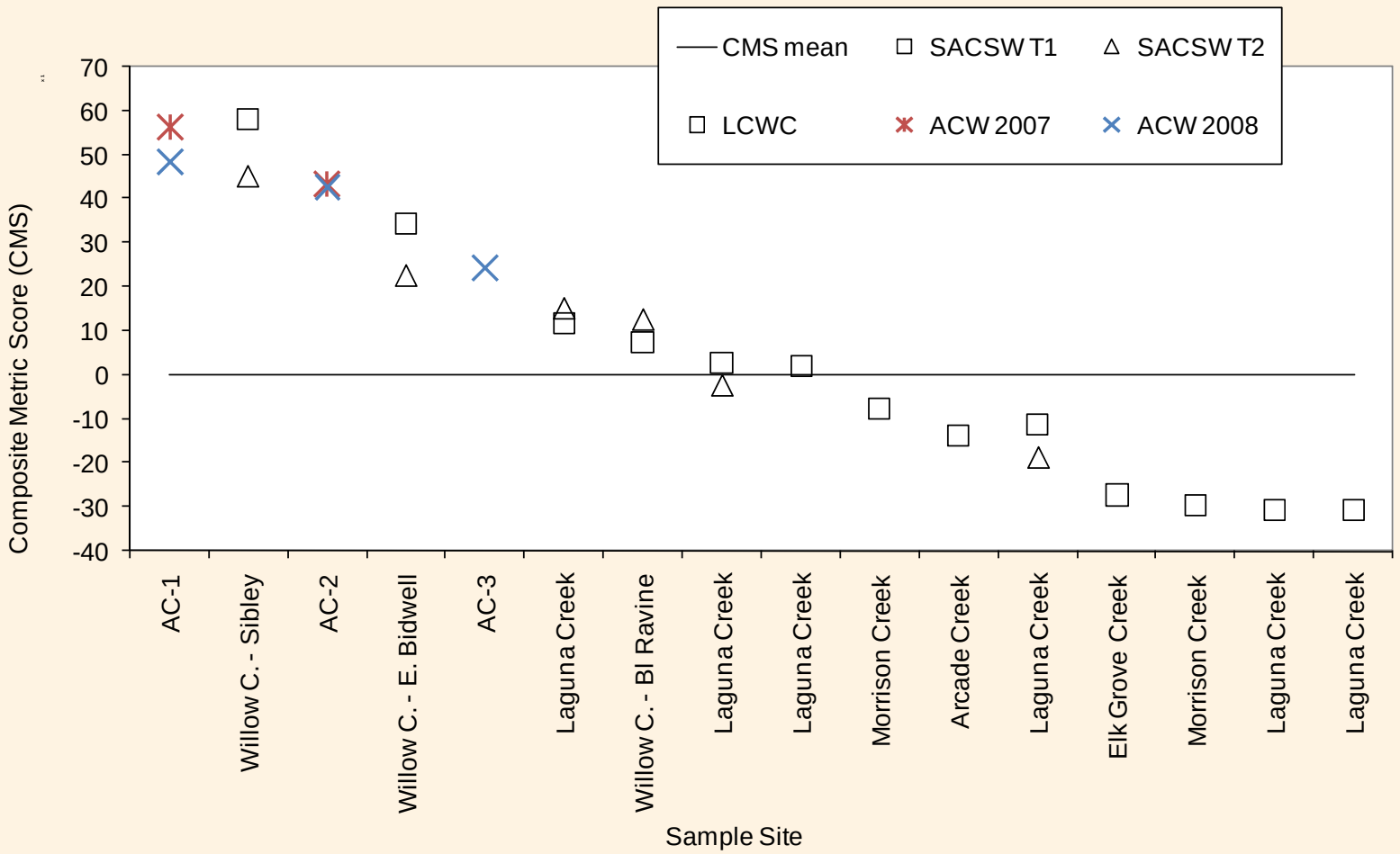
Results – BMI Richness Measures



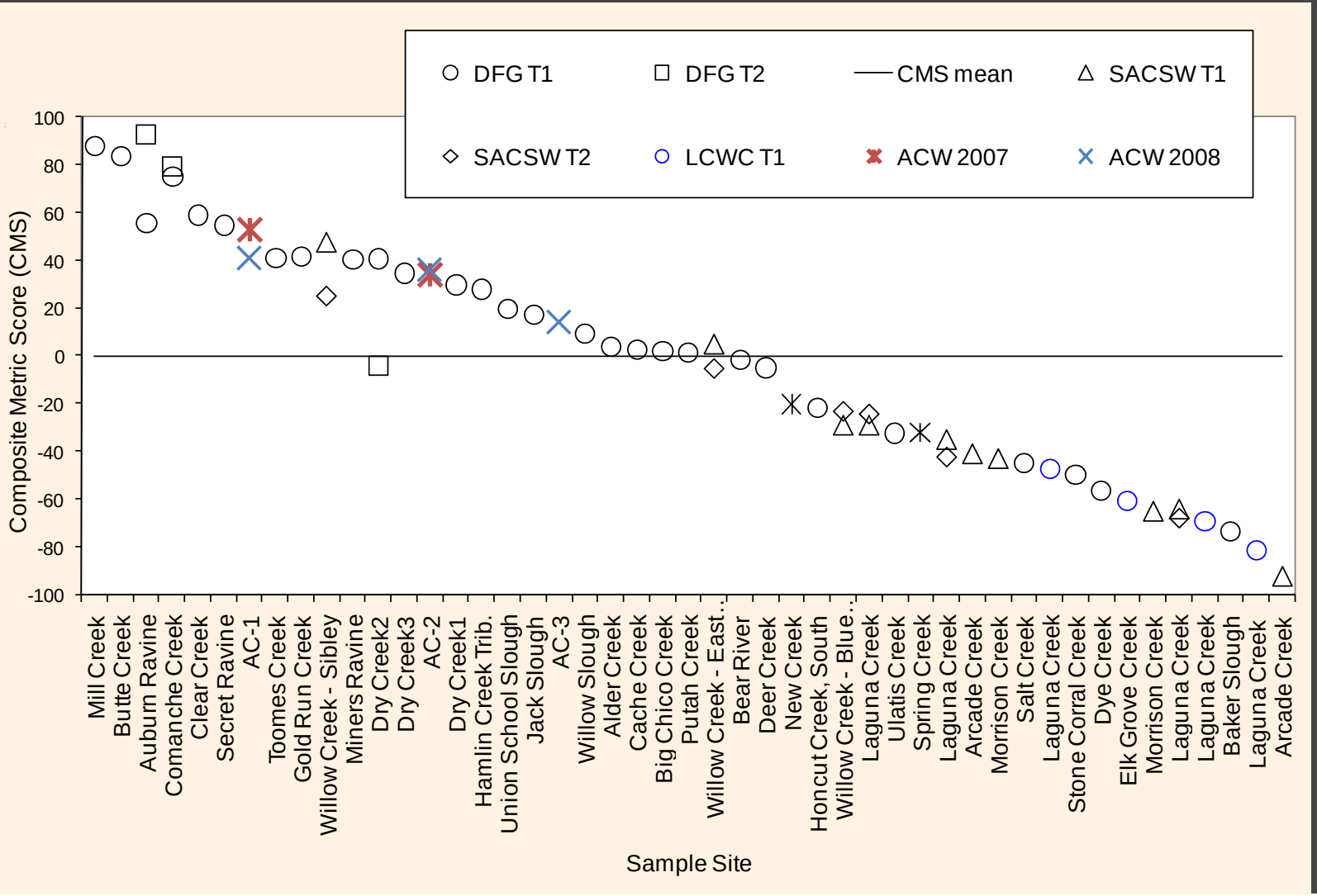
Results – Index of Biological Integrity



Results - Ranked CMS Plot for Sac County Streams



Results - Ranked CMS Plot for Sac Valley Streams

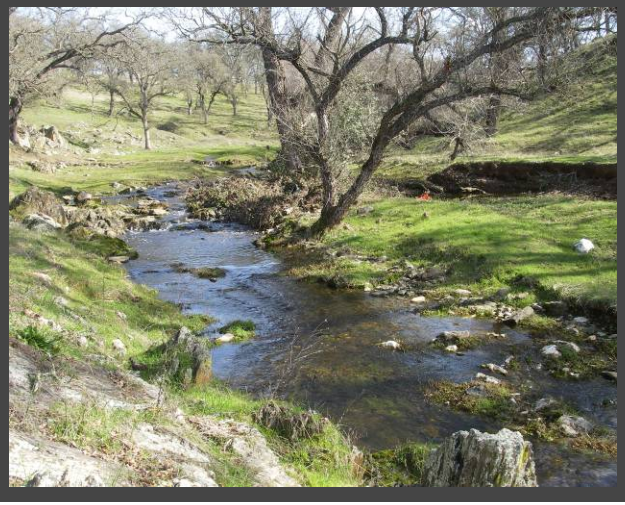


Results – Rapid Vegetation Assessment

- Dense riparian forest canopy and understory
  - Species common throughout CV
  - Alder, willow, cottonwood, oak
  - Blackberry, cattail, primrose

Key Issues / Considerations

- Potential future loss / conversion of sensitive resources
  - Oak / riparian woodland – direct loss and fragmentation
  - Vernal pools and swales - water quality and hydrologic impairment
  - Creeks – intermittent / ephemeral to perennial
  - Riparian corridors – open oak woodland to willow / alder
  - Ponds – accelerated eutrophication



Key Issues / Considerations

- Mercury release and exposure
- Mercury methylation and bioaccumulation

LAKE NATOMA
(including nearby creeks and ponds)
AND THE LOWER AMERICAN RIVER*
FISH CONSUMPTION GUIDELINES

WOMEN OF CHILDBEARING AGE AND CHILDREN AGED 17 YEARS AND YOUNGER EAT NO MORE THAN:	
DO NOT EAT	CHANNEL CATFISH
ONCE A MONTH	White catfish; all bass; pikeminnow; *or* sucker *OR*
ONCE A WEEK	Bluegill; sunfish; or other sport fish species
WOMEN BEYOND CHILDBEARING AGE AND MEN EAT NO MORE THAN:	
ONCE A MONTH	Channel Catfish or all bass *OR*
ONCE A WEEK	White catfish; pikeminnow; or sucker *OR*
3 TIMES A WEEK	Bluegill; sunfish; or other sport fish species

*MANY OTHER WATER BODIES ARE KNOWN OR SUSPECTED TO HAVE ELEVATED MERCURY LEVELS. If guidelines are not already in place for the water body where you fish, women of childbearing age and children aged 17 and younger should eat no more than one sport fish meal per week and women beyond childbearing age and men should eat no more than three sport fish meals per week **from any location**.

EAT SMALLER FISH OF LEGAL SIZE. Fish accumulate mercury as they grow.

DO NOT COMBINE FISH CONSUMPTION ADVICE. If you eat multiple species or catch fish from other water bodies, the recommended guidelines for different species and locations should not be combined. For example, if you eat a meal of fish from the one meal per month category, you should not eat another fish species containing mercury for at least one month.

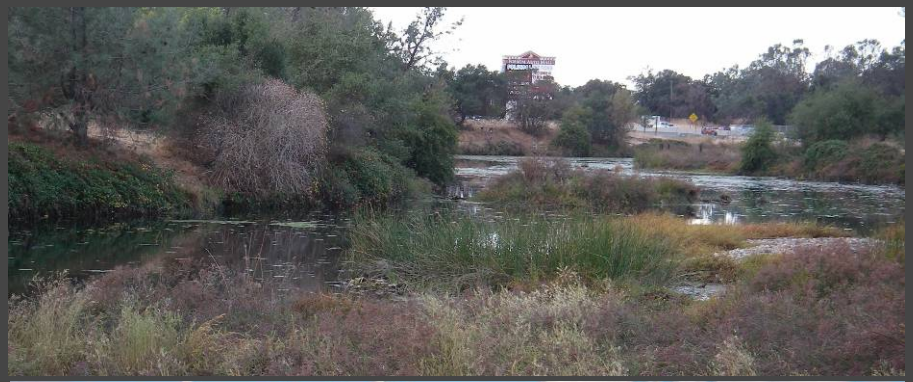
SERVE SMALLER MEALS TO CHILDREN. MEAL SIZE IS ASSUMED TO BE EIGHT OUNCES FOR A 160-POUND ADULT. If you weigh more or less than 160 pounds, add or subtract 1 oz to your meal size, respectively, for each 20 pound difference in body weight.

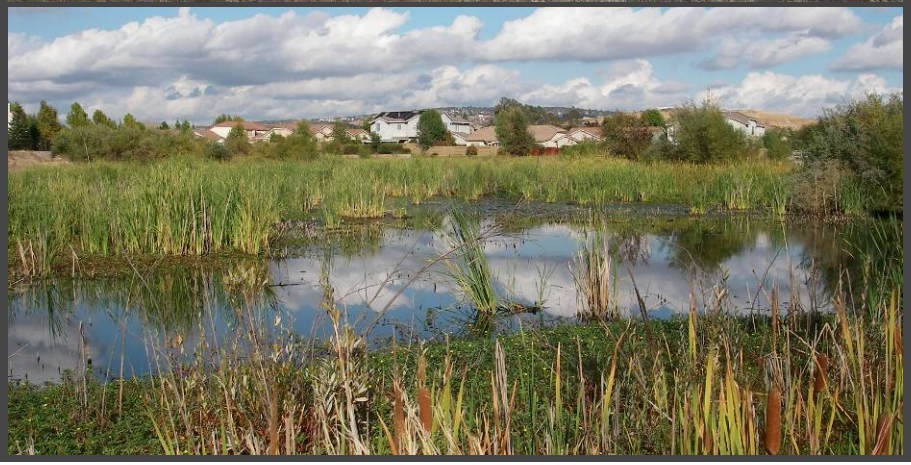
Key Issues / Considerations

- Urbanization and increased stormwater runoff
  - Proposed on-stream detention ponds
  - Hydrologic and geomorphic alterations and modifications

Key Issues / Considerations

- Nuisance vegetation and accelerated eutrofication of ponds and lakes
  - Increased maintenance, loss of function, nuisance



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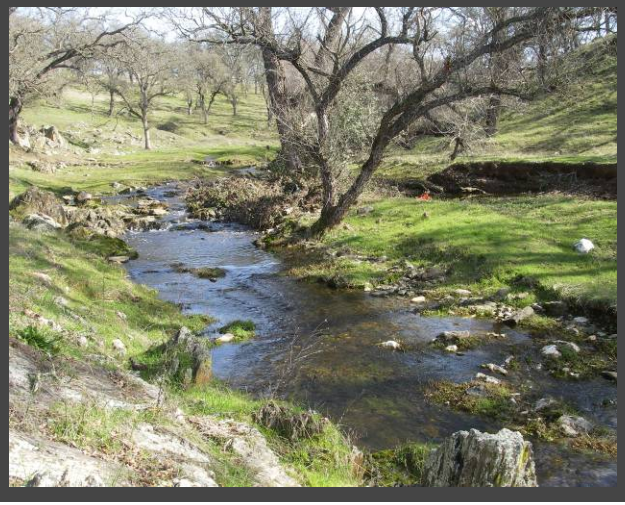
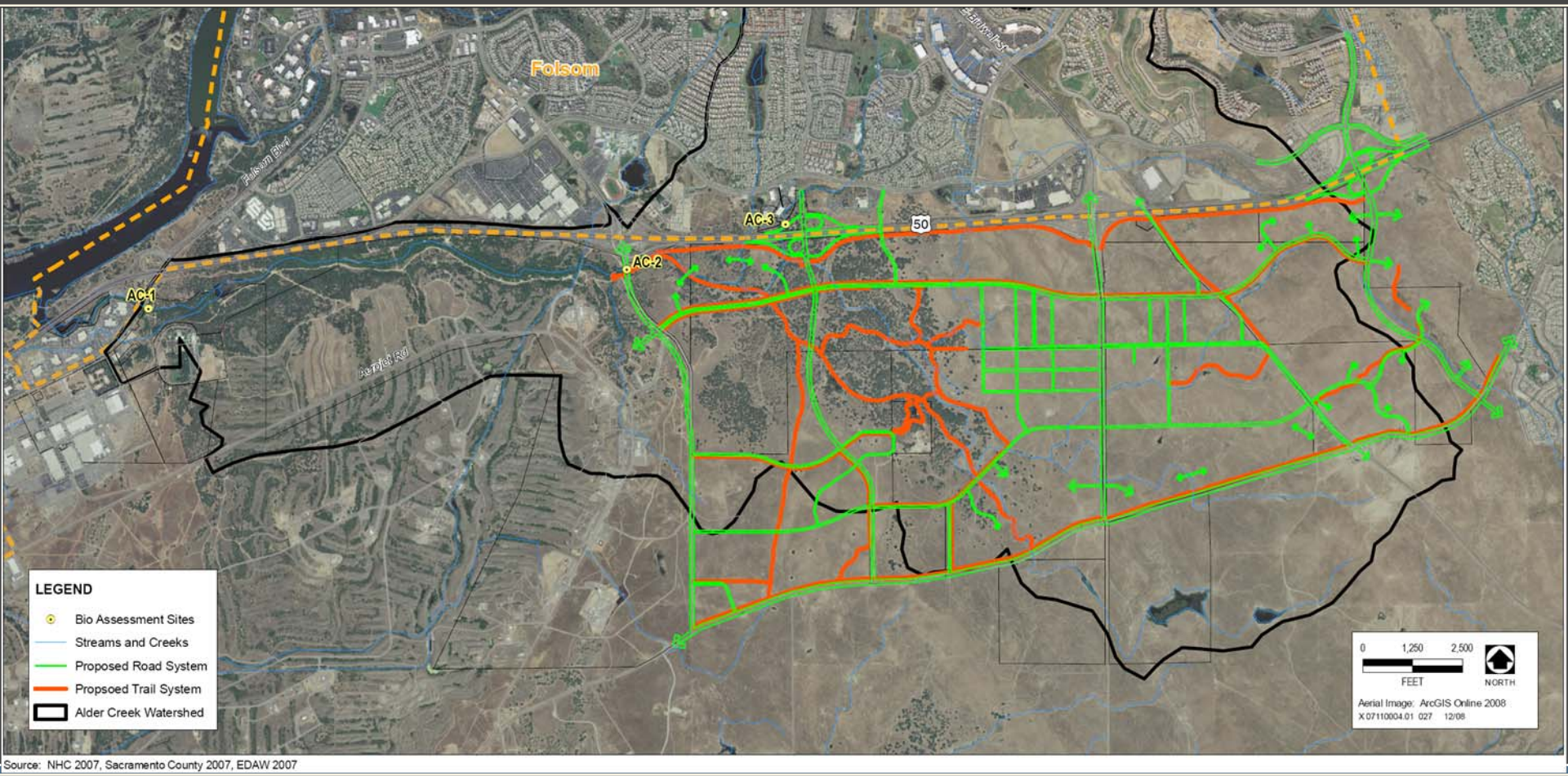


Key Issues / Considerations

» Habitat and multifunctional corridor fragmentation



Source: NHC 2007, Sacramento County 2007, EDAW 2007

Questions or Comments…

Preliminary Recommendations / Potential Solutions

Preliminary Recommendations

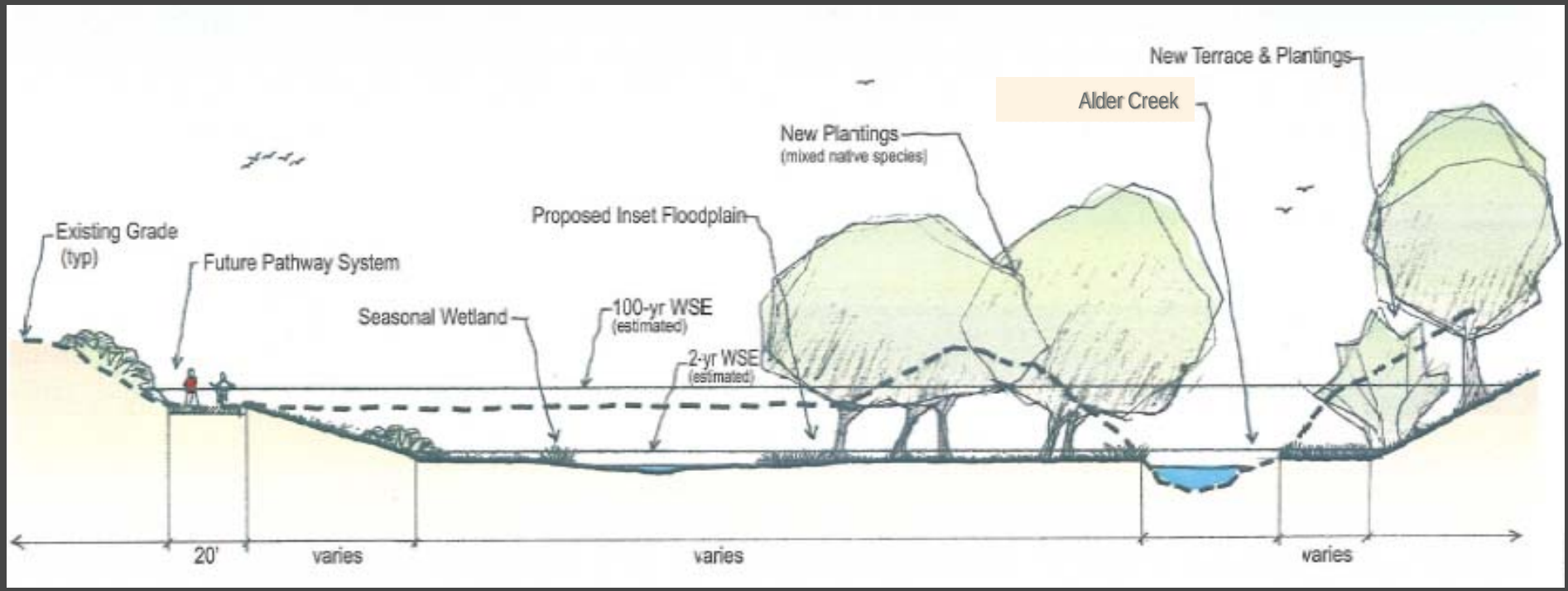
- Protect water quality and hydrologic processes
  - Plan and implement “robust” SWPPP and BMPs to minimize potential for erosion and mercury release and exposure
  - Utilize LID and other water sensitive urban design techniques
  - Control nuisance flows and nutrient loading to the extent feasible
  - Plan new stormwater facilities to be “off-stream”

Preliminary Recommendations cont…

- Designate multi-functional stream setbacks and buffers
  - 200-year floodplain (AB 162)
  - Riparian / oak woodland corridors
  - Wildlife movement
  - Trails (provide local and regional connections)
  - Accommodate increased variability associated with climate change
- Develop buffers between different uses
  (e.g., parks between open space and more developed uses)
- Preserve sensitive resources through targeted designation of open space areas

Preliminary Recommendations cont…

- Protect and restore a functioning floodplain
  - Inset floodplain surfaces that regularly interface with intermediate to high flows



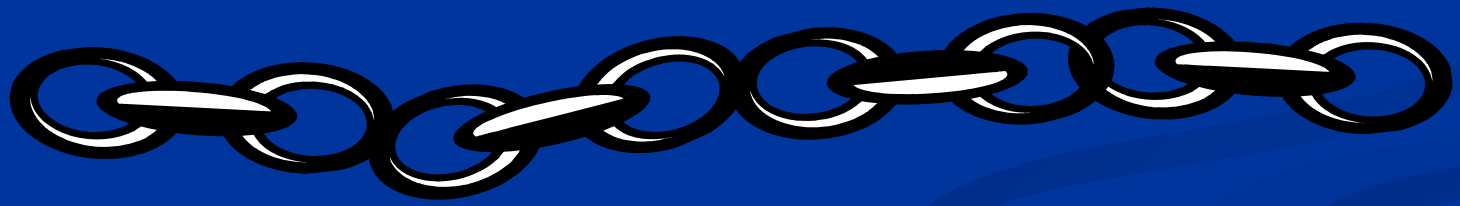
Preliminary Recommendations cont…

- Maintain connectivity
  - Hydrologic and geomorphic (bridges and bottomless culverts)
  - Route urban stormwater away from preserved vernal pools and swales
  - Limit fragmentation of habitats (preserve corridors)
  - Locate trails to provide linkages
    - Sac Valley Conservancy – regional trail corridor
    - Residential to retail to parks to schools

Questions or Comments…

Conceptual Modeling as a Tool for Developing a Watershed Management Plan

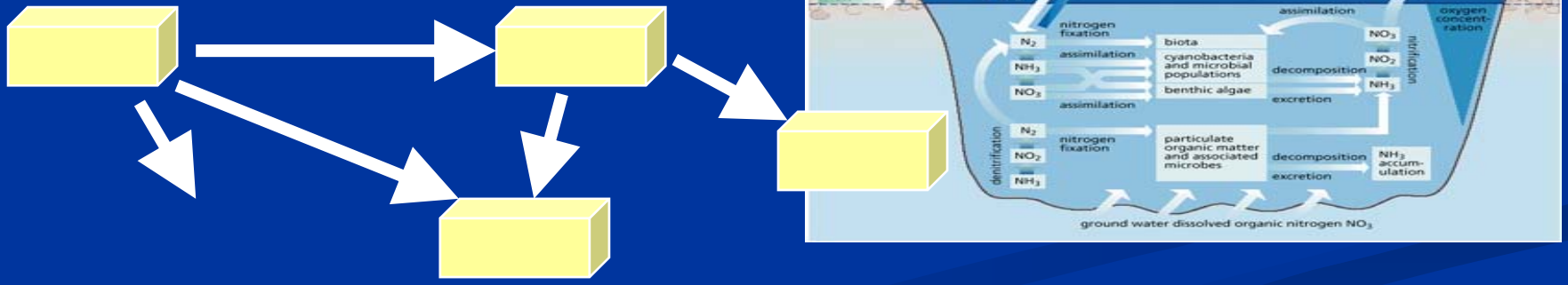
An aid to understanding linkages



Barbara Washburn
Ecotoxicology Program
Office of Environmental Health Hazard Assessment

What is a conceptual model?

- A diagrammatic or narrative representation of how a system works
- A visual model representing causal relationships
- Comes in many forms



A conceptual model of the nitrogen cycle

Key Components of a Model

Issues

The part of the watershed about which you are most concerned. Ex: algae growing in creek

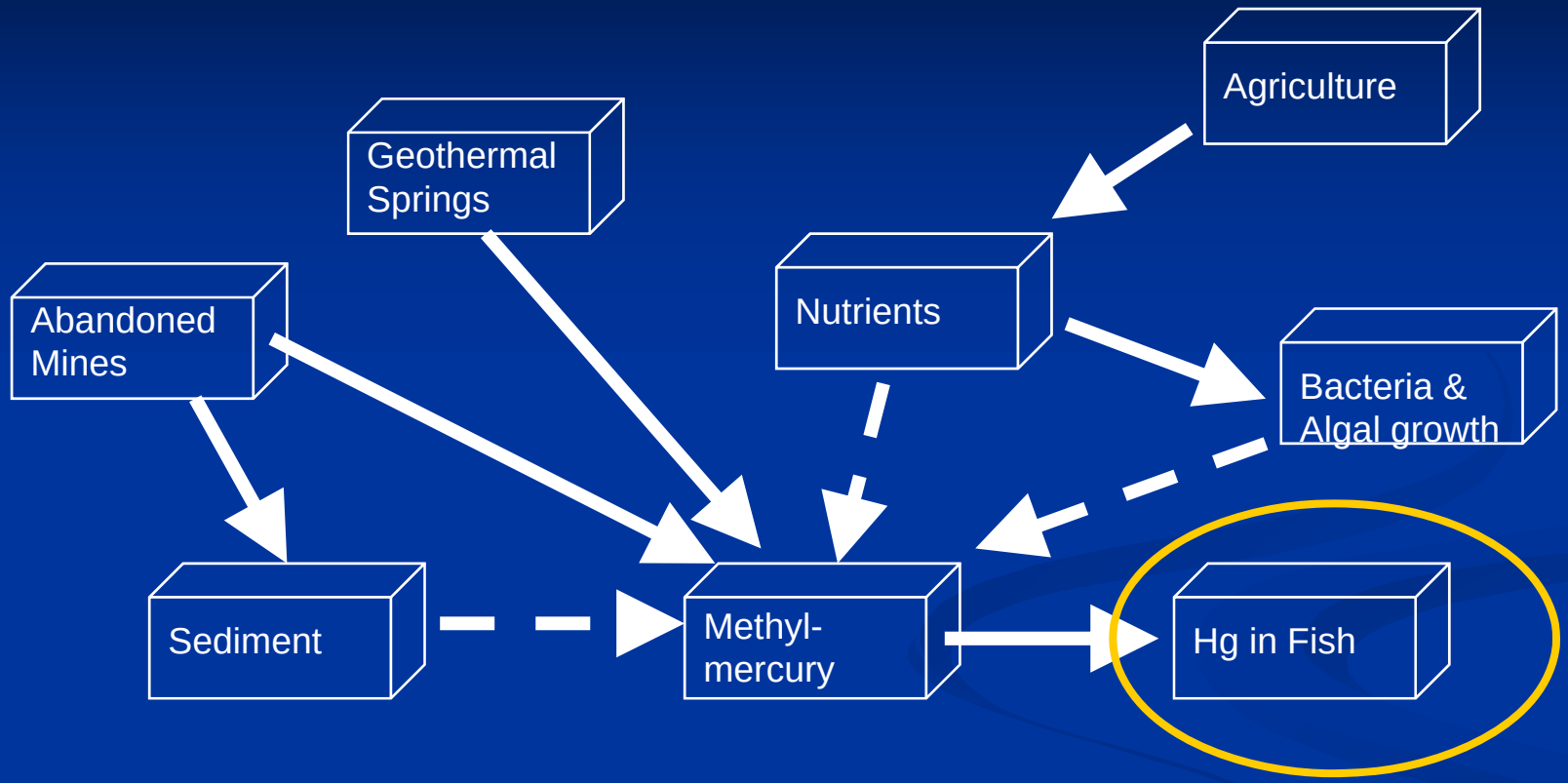
Stressors

Natural or anthropogenic factors (e.g., climate cycles, flow rates) or attributes (e.g., geomorphology) that might be causing the changes about with you are concerned.

Source of Stressors or Causes

Natural or human factors, such as farming, dams, urban development, off-road vehicle use, that produce the stressors.

Sample Conceptual Model



Boxes indicate watershed conditions and processes, arrows indicate possible relationships.

When building the model, start with the issue of concern and work backwards.