

Local Land Use Scenario Formulation using the IPCC SRES Climate Change Scenarios within Nevada

Scott D. Bassett and Michael R. Dolloff

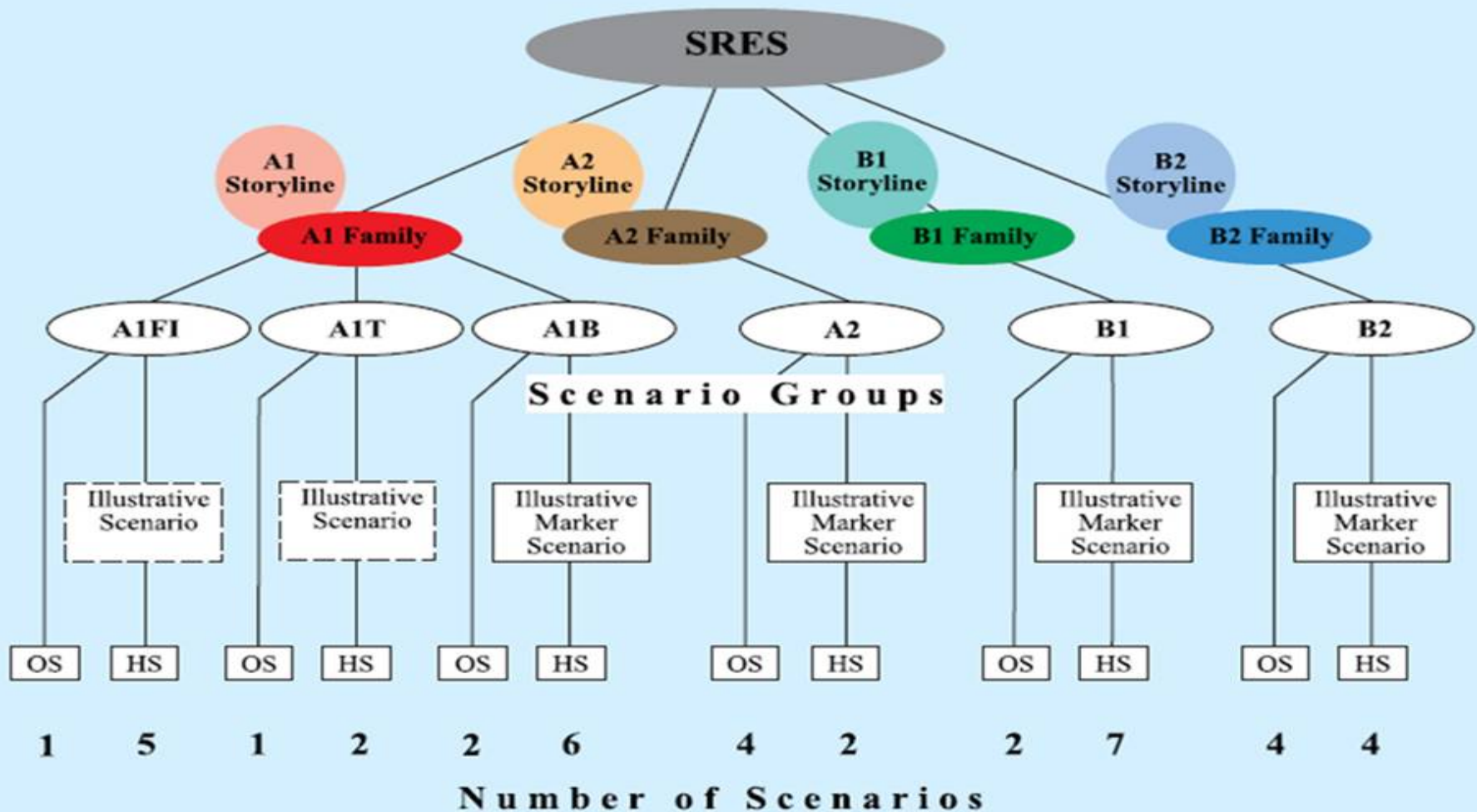
N



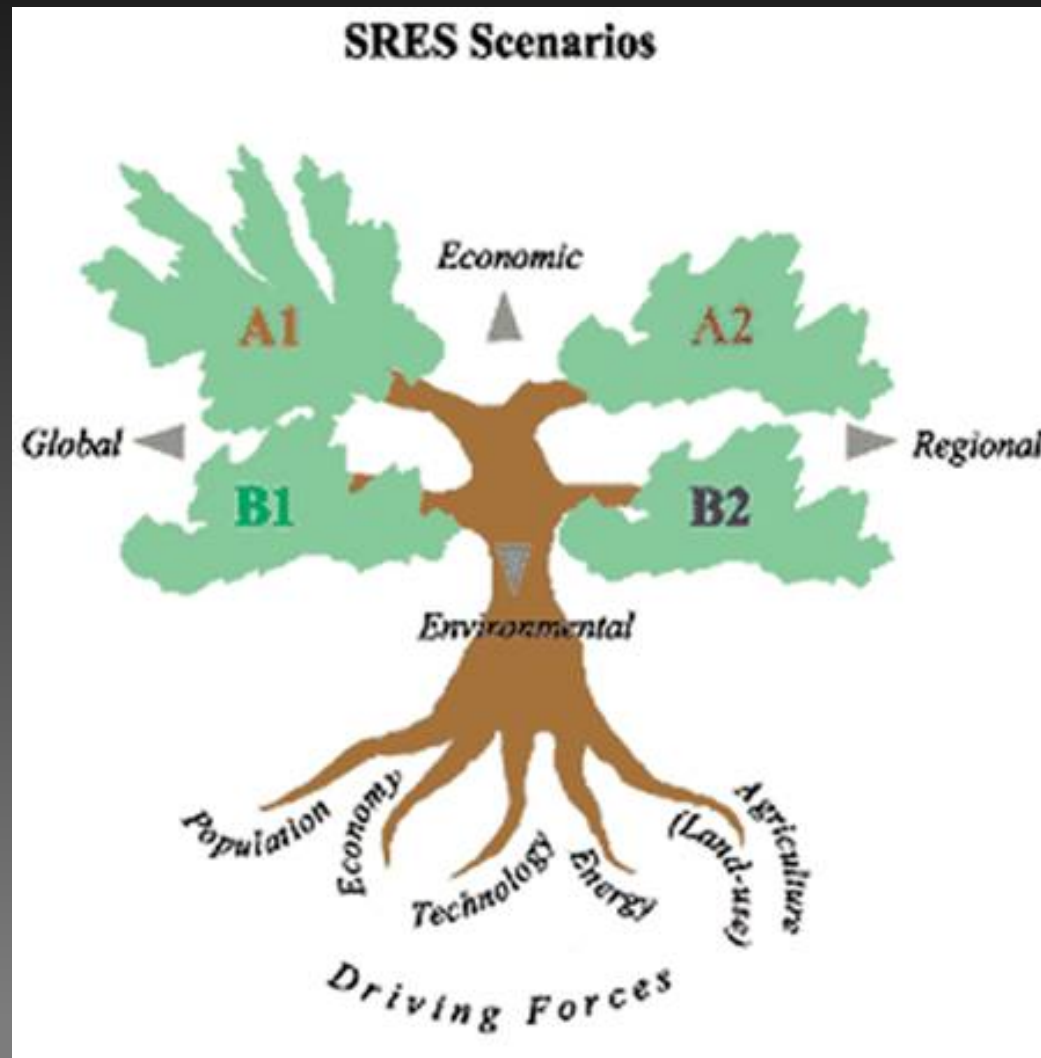
2 February, 2010—Las Vegas

Nakicenovic et al. 2000 IPCC SRES storylines

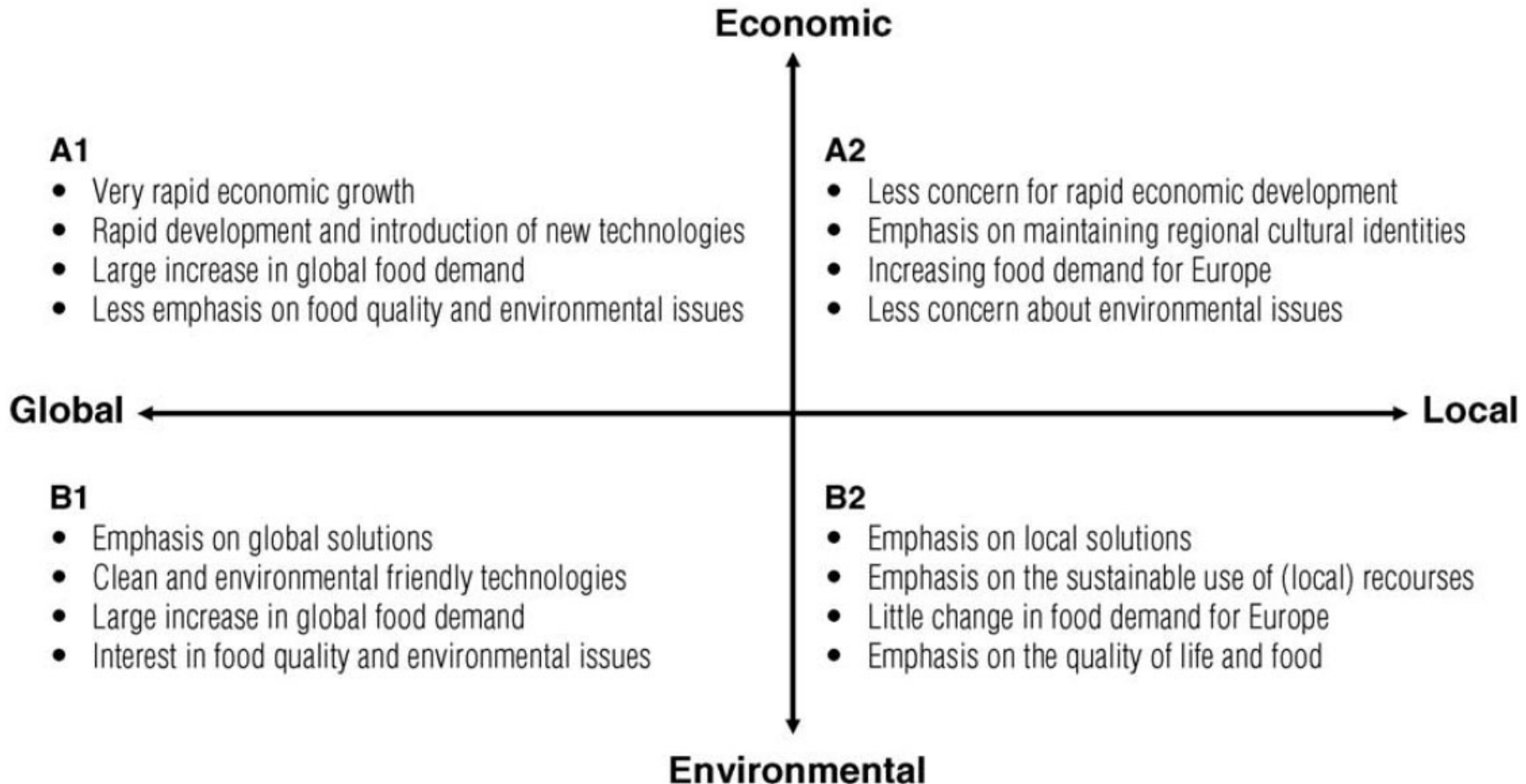
The main characteristics of the four SRES storylines and scenario families



Nakicenovic et al. 2000 IPCC SRES scenarios



Derived Characteristics of the Four Main Scenario Families

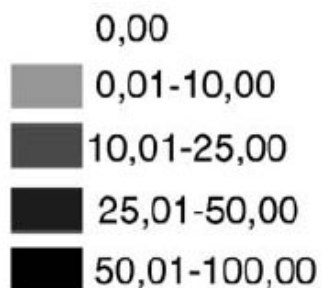


Research Objectives

- Develop a methodology for downscaling SRES for use in land use drivers at a regional scale (metropolitan city scale)
- Integrate land use drivers into urban growth models (UGMs) and land use change models
- Link land use based demand models with river operations to assess potential future water allocations

Modeled Difference in Urban Area

Percentage of urban land use



A1FI-2080



A2-2080



Baseline

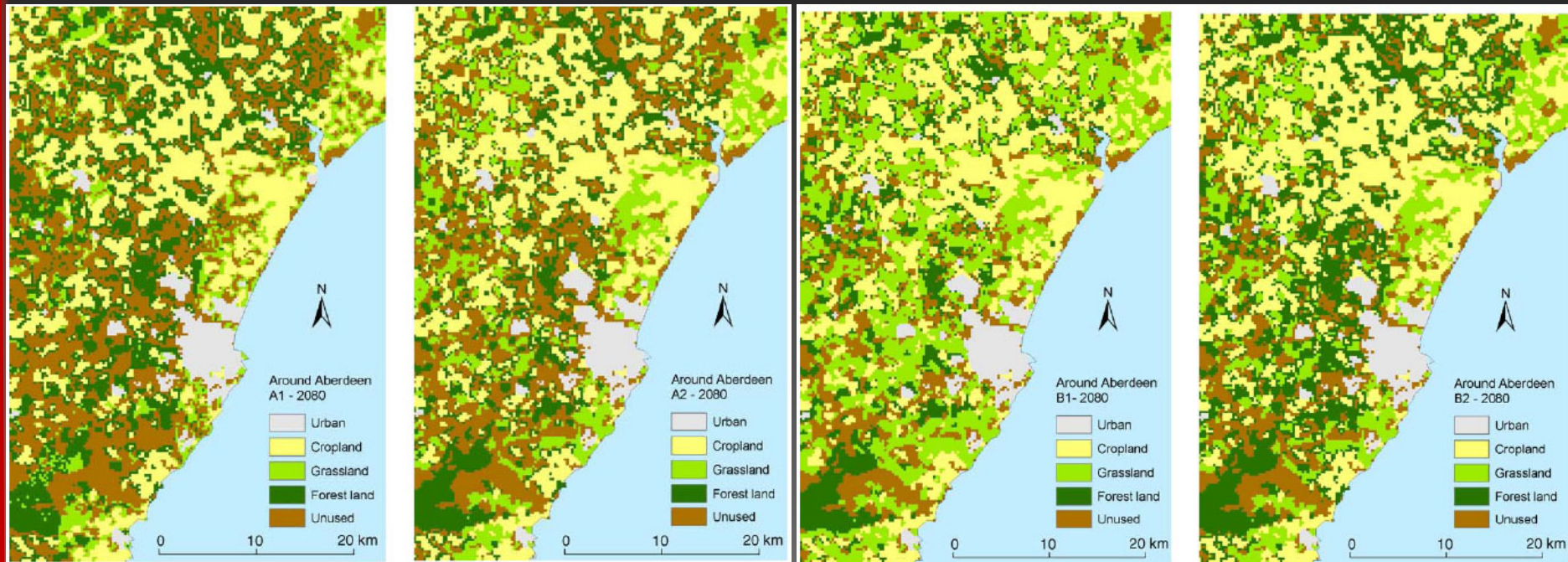


B1-2080

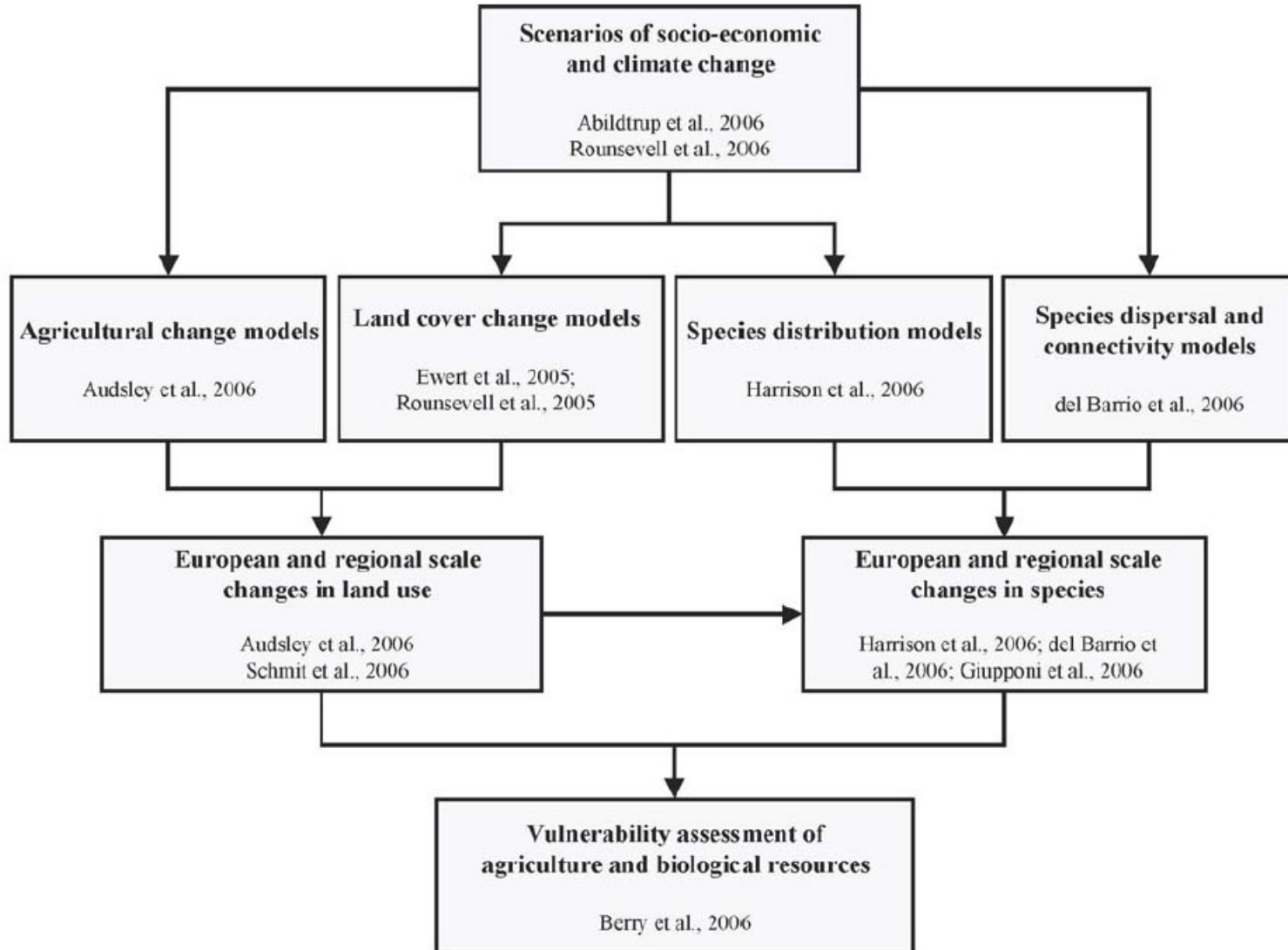


B2-2080

Modeled Difference in Land Use for Scotland



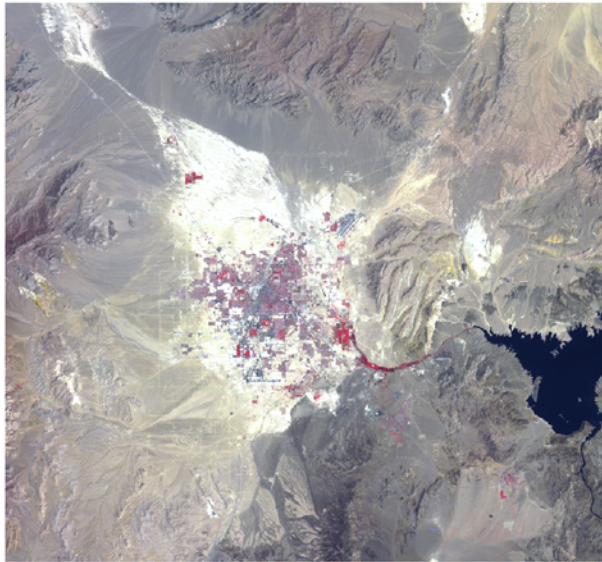
The ACCELERATES Project



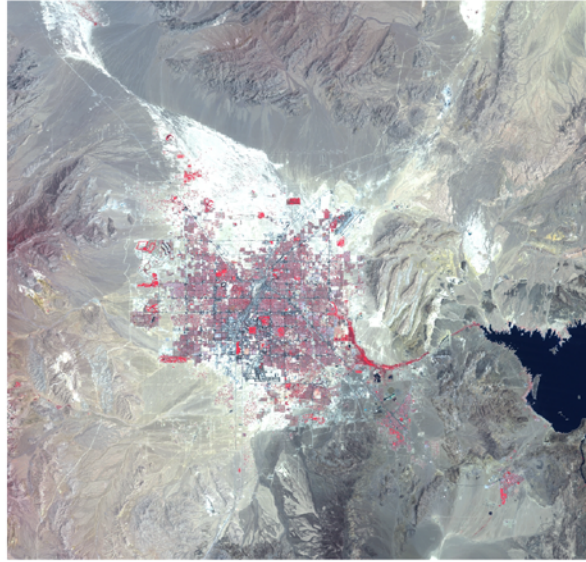
Alternative Futures for the Southwest U.S. Greater Las Vegas

David Mouat, Scott Bassett, Allan Shearer, Scott Thomas, Dakota Casserly,
Quinn Korbolic, Judith Lancaster, Pablo Marin, and E. Jamie Trammell





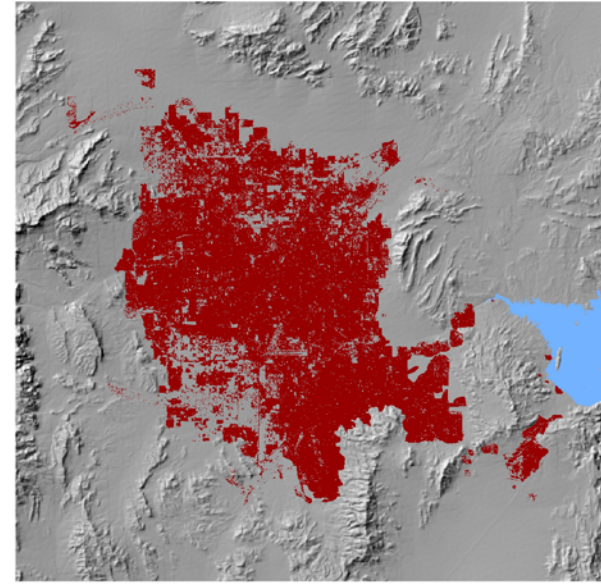
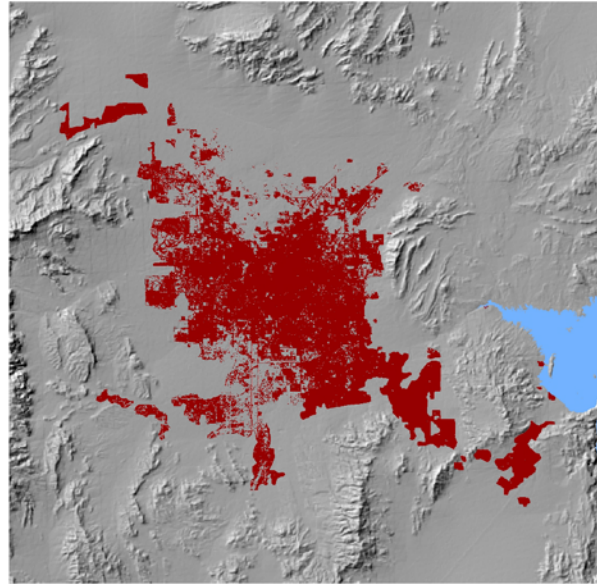
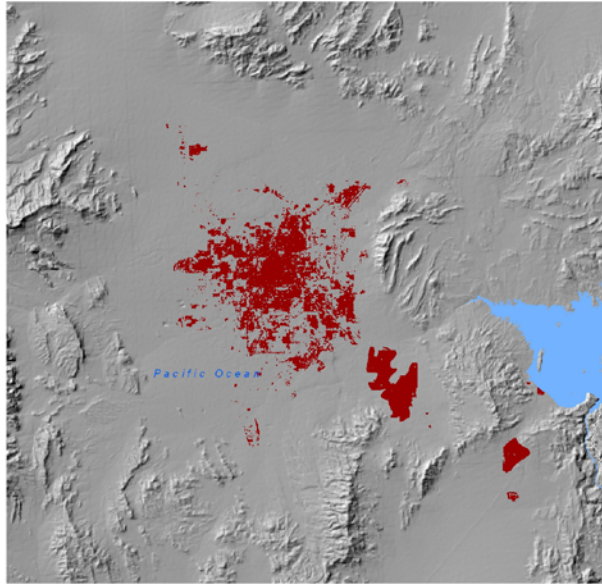
1975



1991

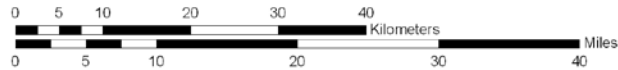


2008



Las Vegas Growth from 1975-2008

Urban Area



Draft



Select Decisions Facing Southern Nevada

- Should the region... support smart growth, transit oriented development, and sustainable growth? (*Metro*)
- Should the region move toward higher residential density? (*Rural*)
- Should Congress continue to direct BLM to release land...? (*Combined*)
- Should growth be managed for compatibility with the mission of military installations...? (*Rural*)
- Should the region continue to secure distant water resources...? (*Metro*)
- Should the region accelerate development of alternative energy sources...? (*Metro*)

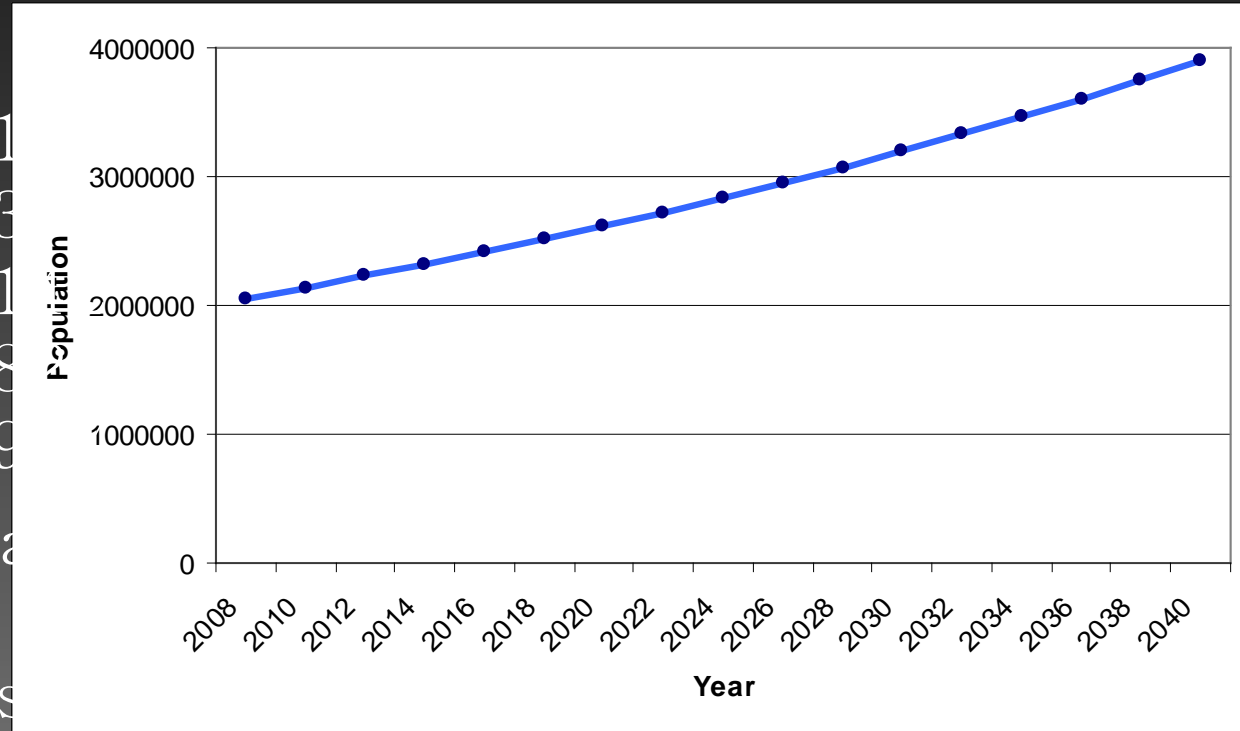
Select Critical Uncertainties for Southern Nevada

- Will sufficient water resources be available...?
(*Combined*)
- Will the BLM land disposal boundary be amended...?
(*Combined*)
- Will wilderness or other currently conserved land be made available for urban development or renewable energy projects? (*Rural*)
- Will the region [develop] ...multi-modal transportation system...? (*Metro*)
- Will solar energy projects be developed that demand already scarce water...? (*Rural*)
- Will growth and development...cause an impact to military operations? (*Combined*)

Alternative Futures

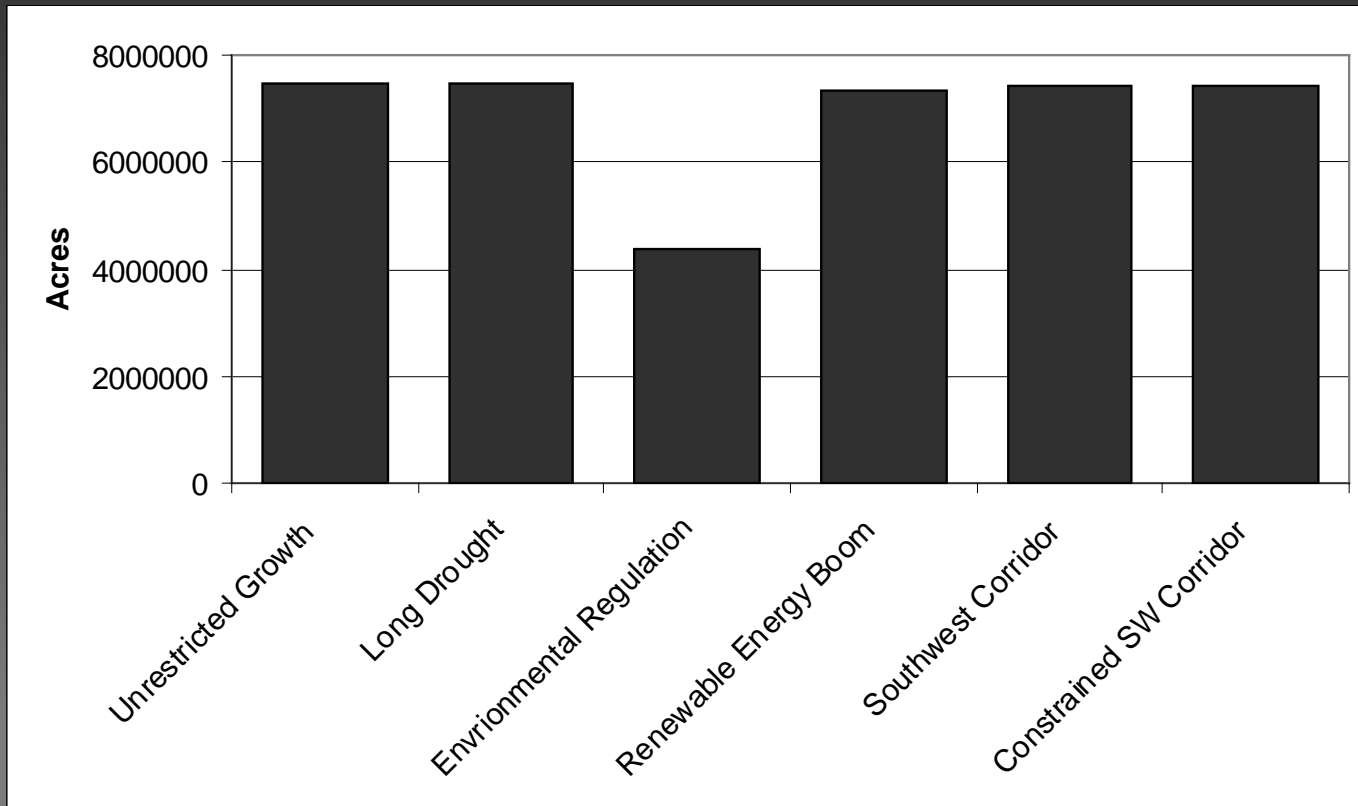
Population

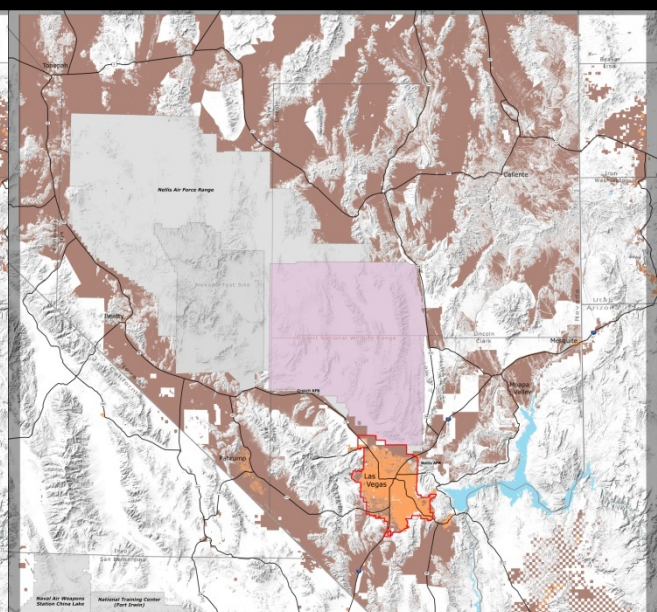
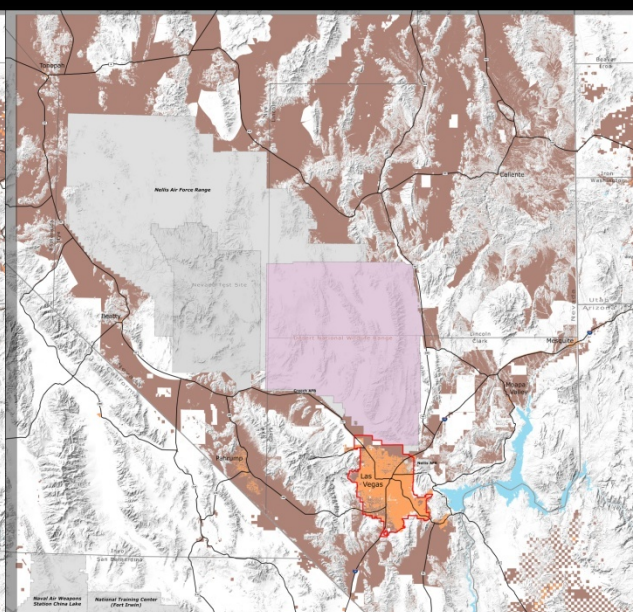
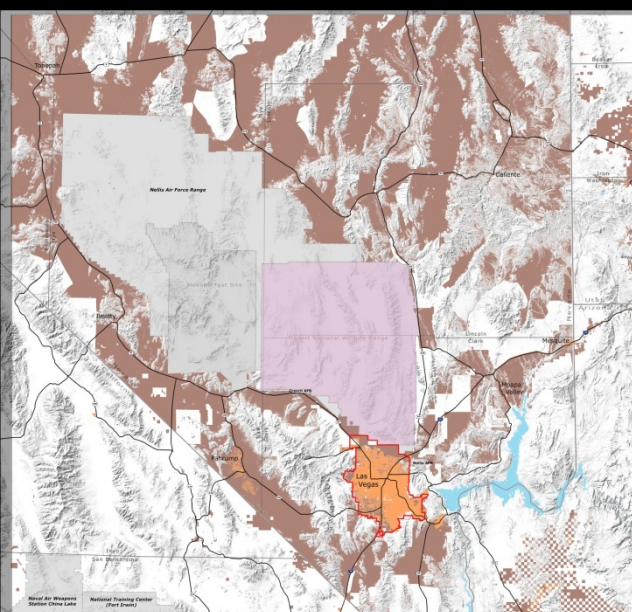
- 2008 – 2,054,100
- 2010 – 2,138,300
- 2020 – 2,614,100
- 2030 – 3,195,800
- 2040 – 3,906,900
- 2.03%, growth rate
- 2.64 people/house



Alternative Futures

- Buildable Land
 - Amount varies by scenario due to the policies and preferences implemented in each scenario

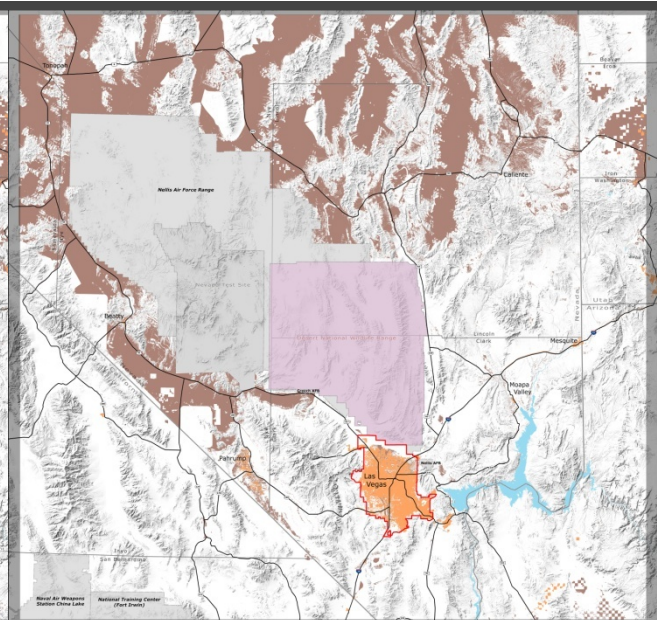
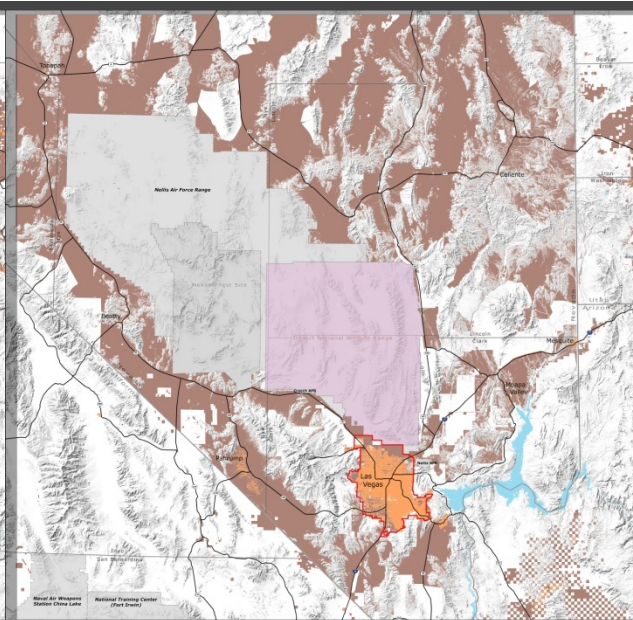
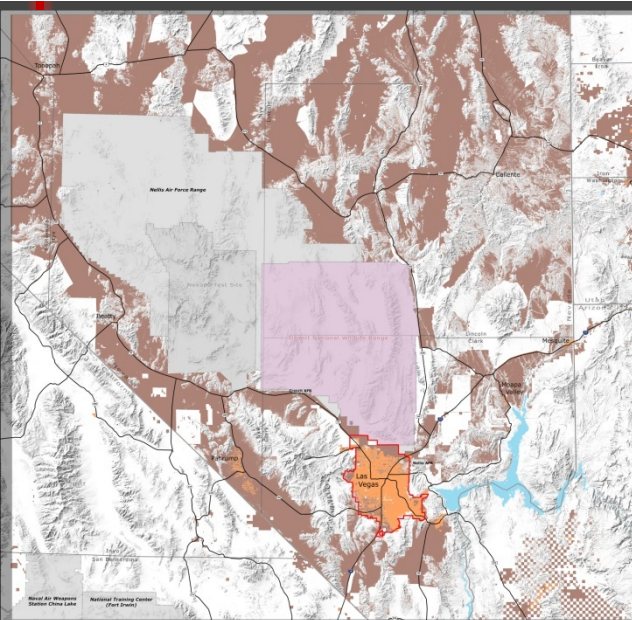




Unrestricted Growth
Buildable Land

Renewable Energy
Buildable Land

Long Drought
Buildable Land



Southwest Corridor
Buildable Land

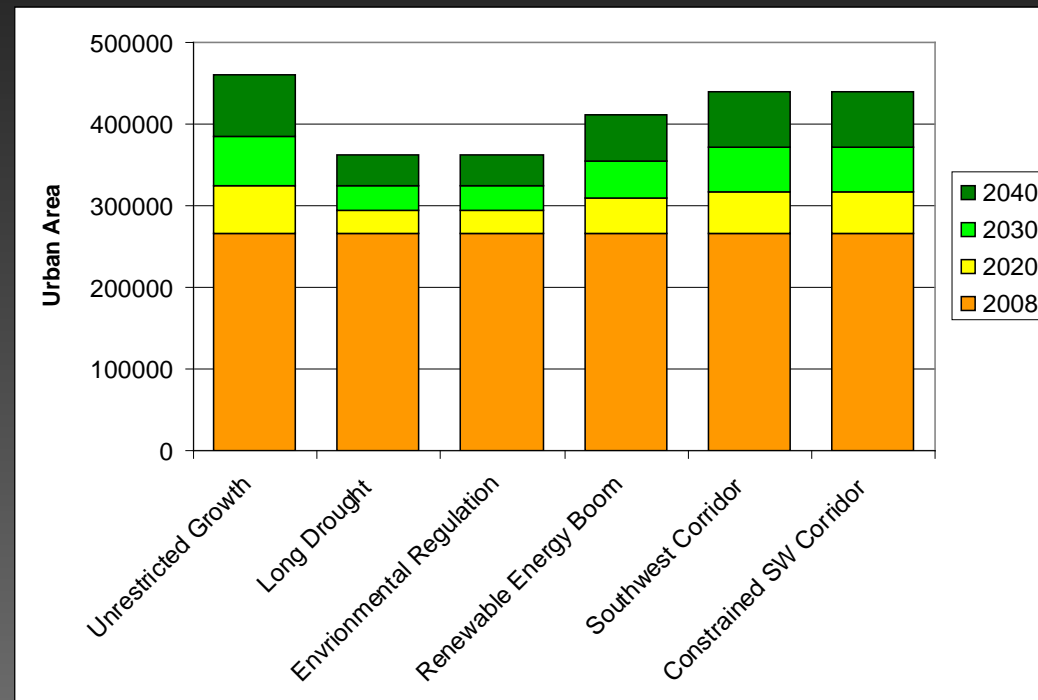
Constrained Southwest Corridor
Buildable Land

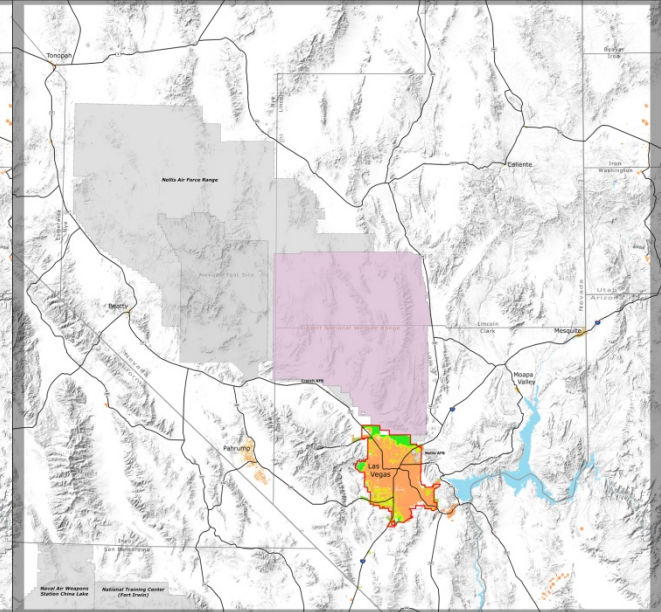
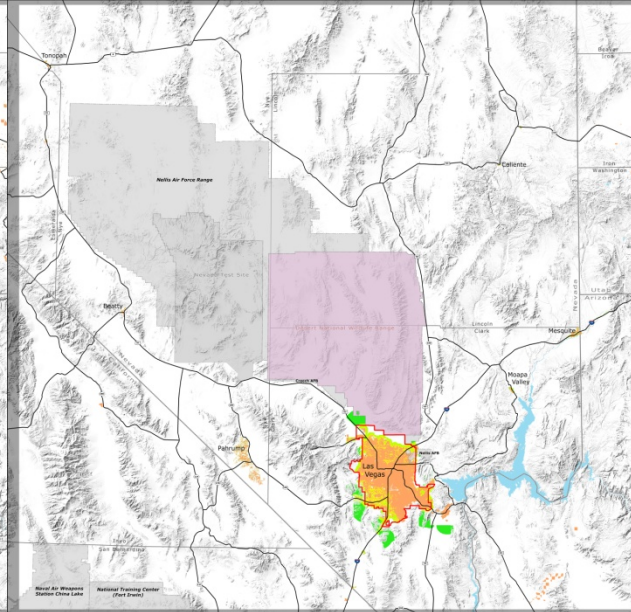
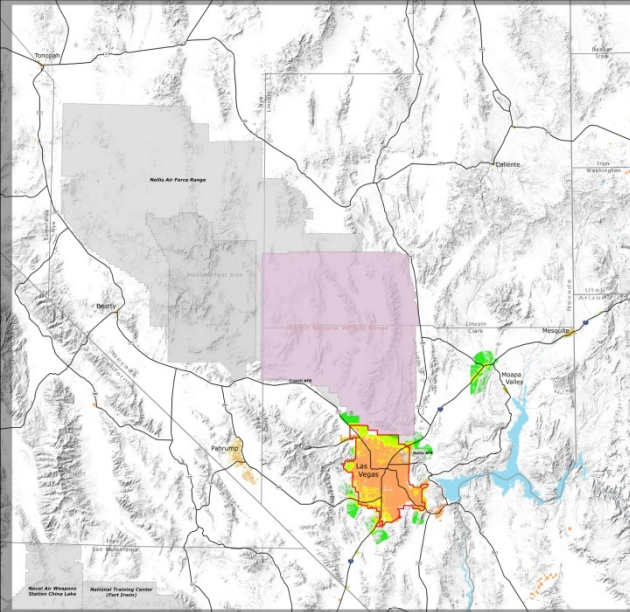
Environmental Regulation
Buildable Land

Alternative Futures

Urban per Household

- Unrestricted Growth
 - 0.28 acres
- Long Drought
 - 0.14 acres
- Environmental Regulation
 - 0.14 acres
- Renewable Energy Boom
 - 0.21 acres
- Southwest Corridor
 - 0.24 acres
- Constrained SW Corridor

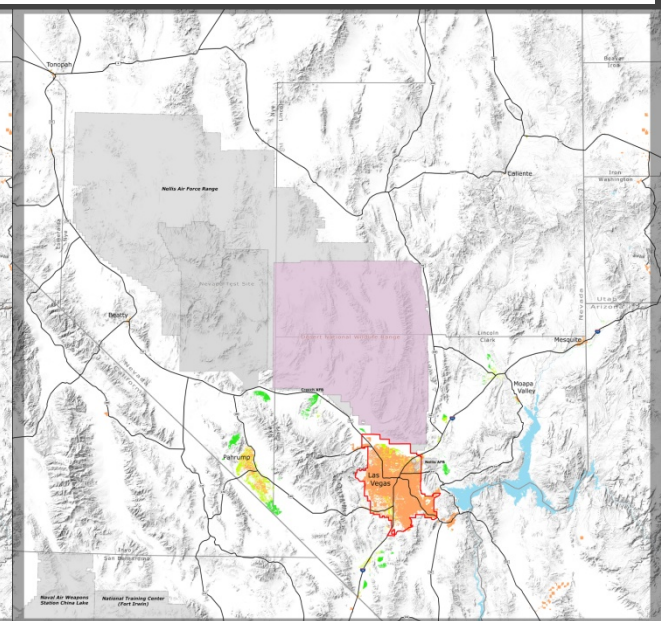
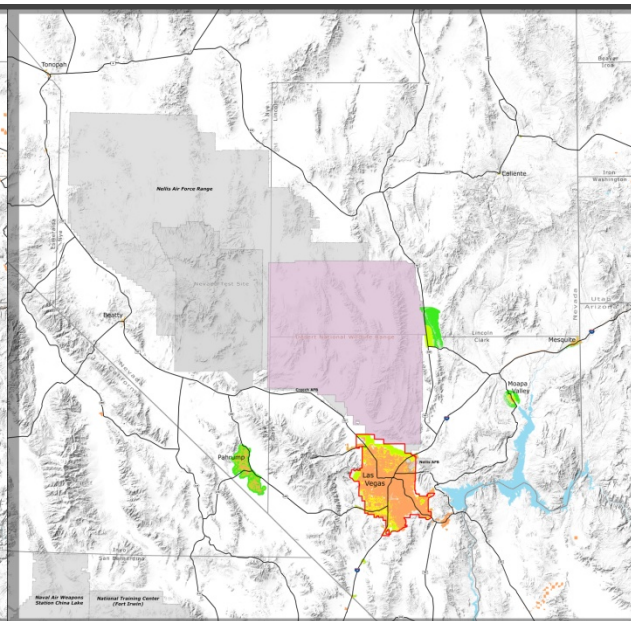
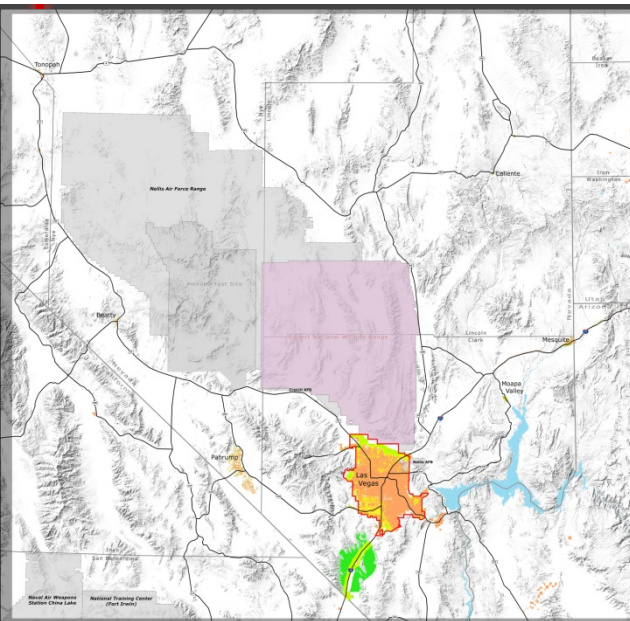




Unrestricted Growth
Urban Growth 2008–2040

Renewable Energy
Urban Growth 2008–2040

Long Drought
Urban Growth 2008–2040

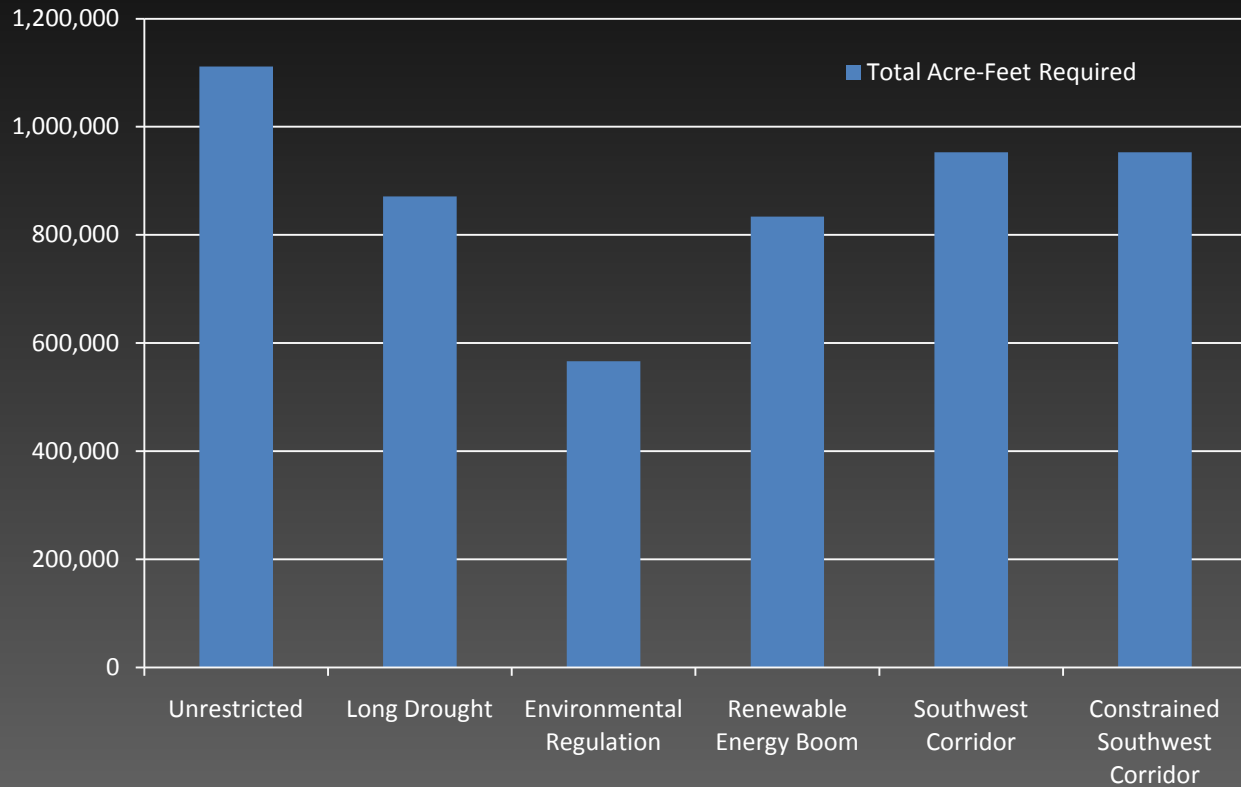


Southwest Corridor
Urban Growth 2008–2040

Constrained Southwest Corridor
Urban Growth 2008–2040

Environmental Regulation
Urban Growth 2008–2040

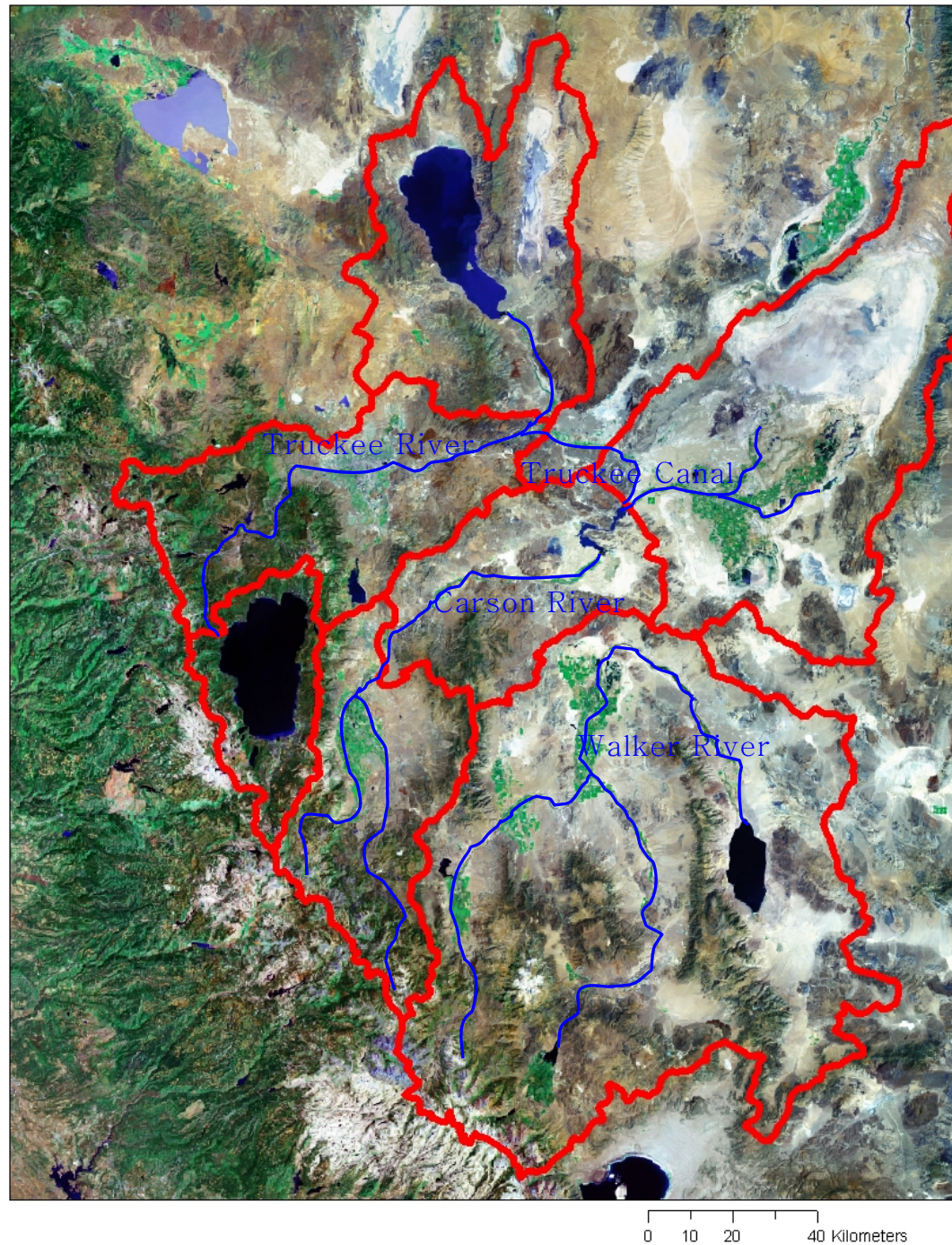
Water Requirements



Alternative Futures	Total GPCD	GPCD Δ	% GPCD Δ	Total GPD	Total Acre-Feet Required
Unrestricted	254	0	0.00%	992,361,998	1,111,587
Long Drought	199	-55	-21.65%	777,480,463	870,889
Environmental Regulation	129	-125	-49.07%	505,362,301	566,078
Renewable Energy Boom	191	-64	-25.00%	744,271,499	833,690
Southwest Corridor	218	-36	-14.29%	850,595,998	952,789
Constrained Southwest Corridor	218	-36	-14.29%	850,595,998	952,789

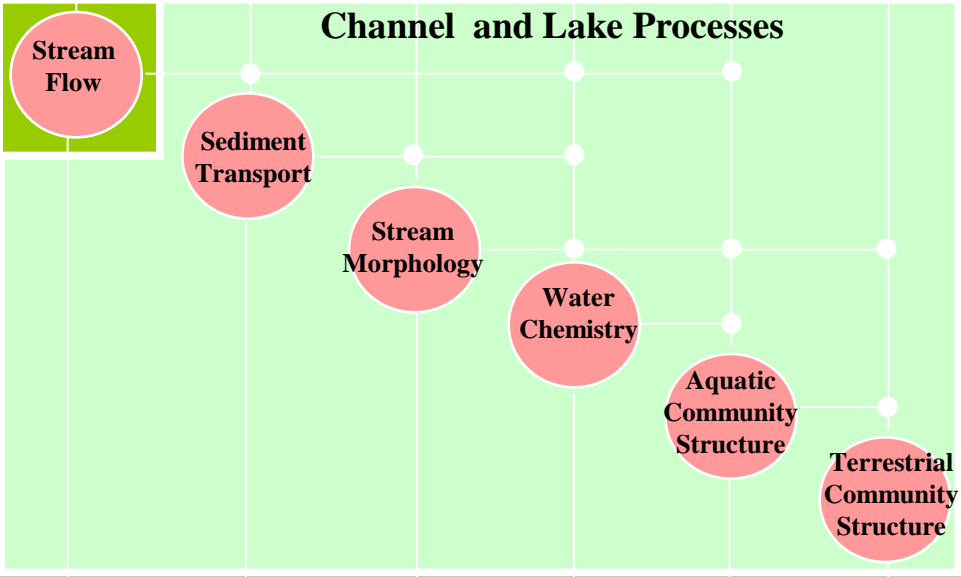
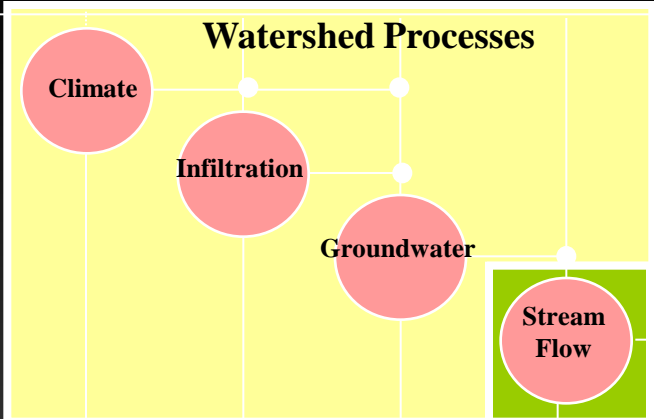
GPCD = Gallons per capita daily

Truckee and Walker River Basins



Existing Condition, Policies, & Plans

Land cover & Structures



Land use Attract.

Precipitation & Temperature

Infiltration

Groundwater Volume

Stream Flow

Sediment Transport

Stream Morphology

Water Chemistry

Aquatic Community Structure

Terrestrial Community Structure

Scenarios

Future Land cover & Structures

Future Precipitation & Temperature

Future Infiltration

Future Groundwater Volume

Future Stream Flow

Future Sediment Transport

Future Stream Morphology

Future Water Chemistry

Future Aquatic Community Structure

Future Terrestrial Community Structure

Reno–Sparks trend in Driving Forces as defined by SRES

Driving Factors	Region: Reno/Sparks Metropolitan Area			
	IPCC SRES Scenarios			
	A1FI	A2	B1	B2
<i>Demographic (D):</i>				
Population growth (1)	Low	High	Medium	Medium
<i>Environmental (En):</i>				
Environmental regulations (1)	Low	Low	High	Medium
<i>Political (P):</i>				
Federal influence (1)	Medium	Low	High	Medium
State influence (2)	Low	Medium	Low	Medium
Local influence (3)	Medium	High	Low	High

Summary

- Scenarios translated and run using urban growth model for Las Vegas (based on stakeholder input)
- Water demands for Las Vegas estimated given the different scenarios
- Reno–Sparks—deriving trends in driving forces based on SRES begun
- Overall we believe one key emphasis should be on river operations, not solely supply and/or demand

One Year Outlook

- Convert driving forces into model parameters and variables (Reno and Walker) – see how the framework for downscaling SRES works
- Implement land use change model in Reno – Sparks and Walker Basin
- Quantify stream flow and lake levels for the Walker River Basin driven by climate change considerations
- Expand Lower Colorado analysis to Yuma, AZ and Imperial Valley