

Abstract

The ability to project urban growth scenarios that represent a suite of potential land-use policies is crucial to understanding future landscape change, especially in the context of climate change. Many of the resources that support urban growth are likely to be affected by changes in climate. The combined impact of increasing urbanization and climate change on critical resources like fresh water, energy and ecosystem health varies with different future scenarios. This study designed potential urban growth scenarios for the greater Las Vegas area. Growth scenarios highlight potential policy choices on which lands may be excluded from development and which lands may attract development. Six scenarios are identified: Unrestricted Growth, Long Drought, Environmental Regulation, Renewable Energy Boom, Southwest Corridor and Constrained Southwest Corridor. The scenarios vary in their relative impact, both positively and negatively, as measured through a series of biophysical and socioeconomic models. Current population for the study area is roughly 2 million, and is expected to grow to 3.9 million by 2040. Intensity and type of growth varies by location, according to a suite of potential policy choices expressed by local and regional stakeholders. Comparison of the potential impacts associated with each land use pattern provides a tool for land use managers to understand future impacts of potential policies. Impacts on water resource availability and biodiversity resources are presented as examples of the many types of impacts that can be modeled using the alternative futures framework.

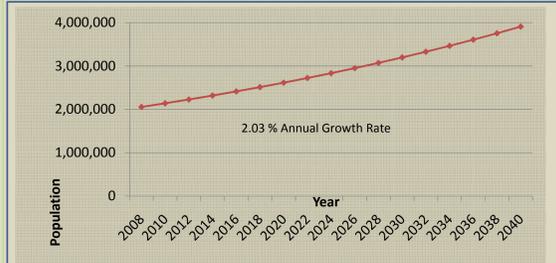
Introduction

- Population growth on a worldwide, national, and regional scale has forced most cities to expand their urban footprint in order to accommodate the expanding population.
- Urban expansion in Las Vegas has threatened several plant and animal species.
 - Including the federally listed Desert Tortoise
- Population forecasts project that 1.9 million new residents will move to the region by 2040.

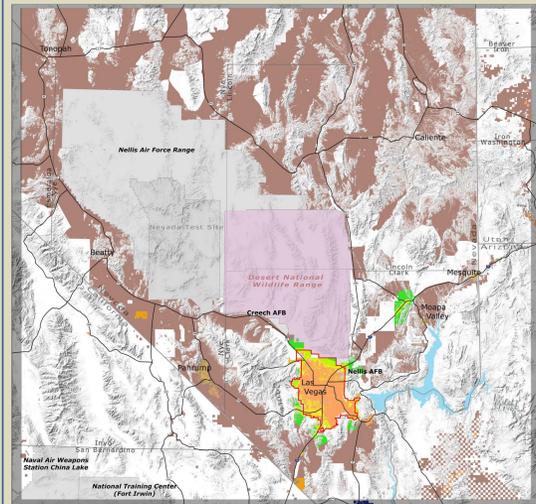
Can Las Vegas grow as projected while still maintaining acceptable levels of environmental protection, safety, and public services?

- Critical species habitat and water resources are identified as primary issues of importance according to local and regional stakeholders
- While there are an infinite number of possible scenarios; this study establishes six distinct patterns of urban growth that help to show what types of policies could lead regional growth in different directions.
- By focusing on land ownership and land use change, this study provides a tool for land managers and owners to come together to address common concerns about land use change.
- This study attempts to evaluate the possible consequences of multiple scenarios by quantifying some of the resulting social and environmental impacts of urban growth.
- This study is intended to be a platform for examining the implications of policy choices on the future urban landscape and services.

Methods

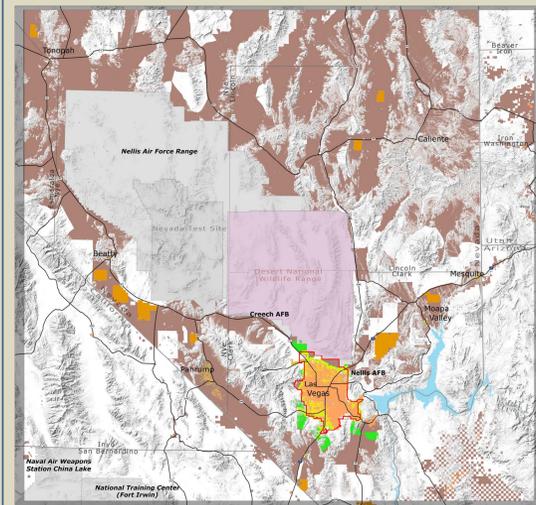


- Scenarios are written as narratives from the future based on results from social surveys of stakeholders throughout the region.
- Each scenario allocates 1.9 million new residents to the Las Vegas area by 2040, as is projected by the U.S. Census Bureau and the Nevada State Demographer.
- Future growth in the form of houses and commercial centers are allocated using a GIS model, based on buildable land.
 - Included is potential public land sales due to the success and likely continuation of the Southern Nevada Public Lands and Management Act of 1998 (SNPLMA).
- Housing varies by scenario from 0.14 to 0.28 houses/acre after roads, parks and other infrastructure are included with 2.64 people/household.
- The six possible futures for urban growth correspond to scenarios describing possible evolutions in economic, political, legal and environmental policies that could lead regional growth in different directions.
- The details in the alternative futures narratives are not meant to be absolute forecasts, or to be considered the only way the region could arrive at such a built form.



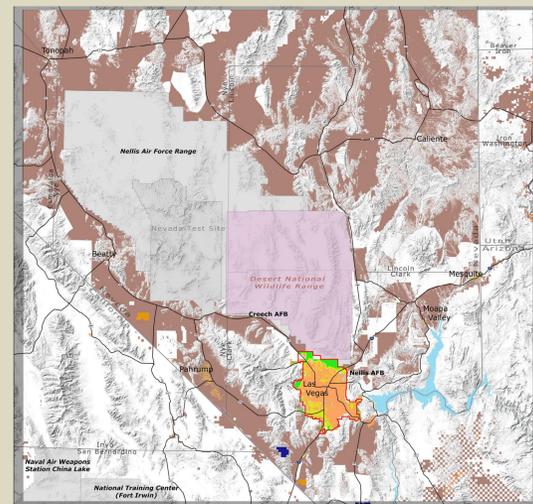
Unrestricted Growth

Reduced federal government influence expands BLM disposal boundary, allowing continued growth into disposed federal lands. Land use planning favors larger lot single family homes, taking advantage of relaxed environmental regulation. Renewable energy projects support some economic growth.



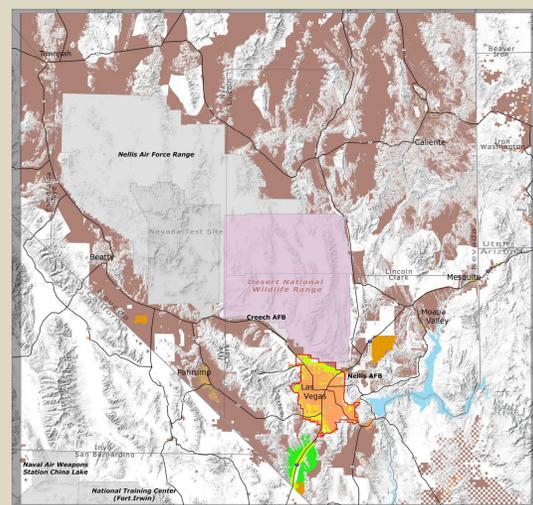
Renewable Energy Boom

With extensive federal government backing, renewable energy development explodes throughout southern Nevada. This includes massive solar projects, wind farms, and the opening of Yucca Mountain to support nationwide nuclear power development. Oil price spike in 2016 further supports the renewables boom, and encourages urban infill.



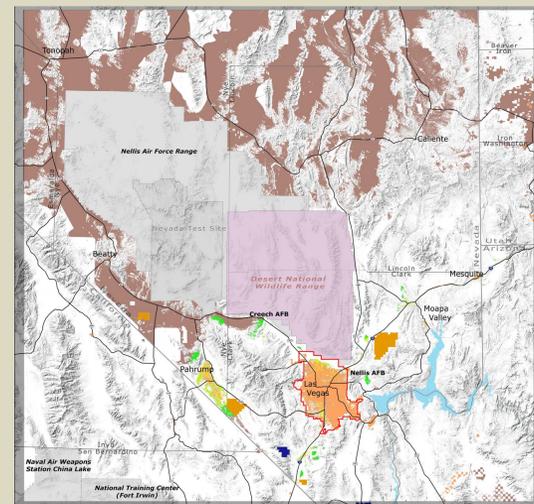
Long Drought

Water shortage causes a slow down in growth. The level of Lake Mead drops below the outlet pipes. Higher density housing projects become the focus, as is the groundwater importation project by SNWA. Water conservation is increased, including favoring traditional PV solar over solar thermal projects. Water management allows more federal government influence on regional planning and eventually reworks of the Colorado River Compact.



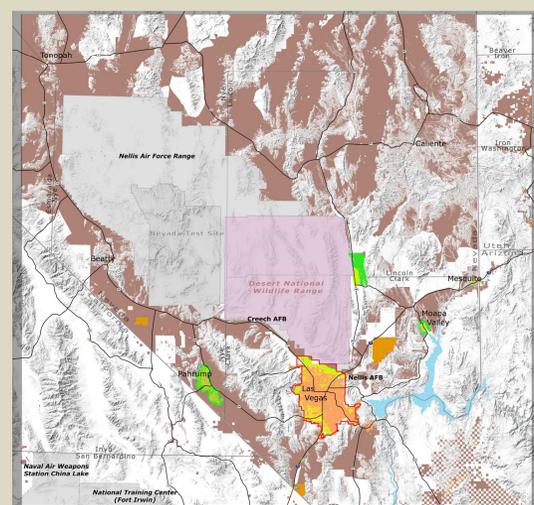
Southwest Corridor

McCarran Airport reaches its capacity requiring construction of the new Ivanpah Airport 30 miles southwest on I-15. Early development favors commercial and industrial development, but the area eventually grows into the new southwest suburb of Las Vegas, supporting a new light rail system.



Environmental Regulation

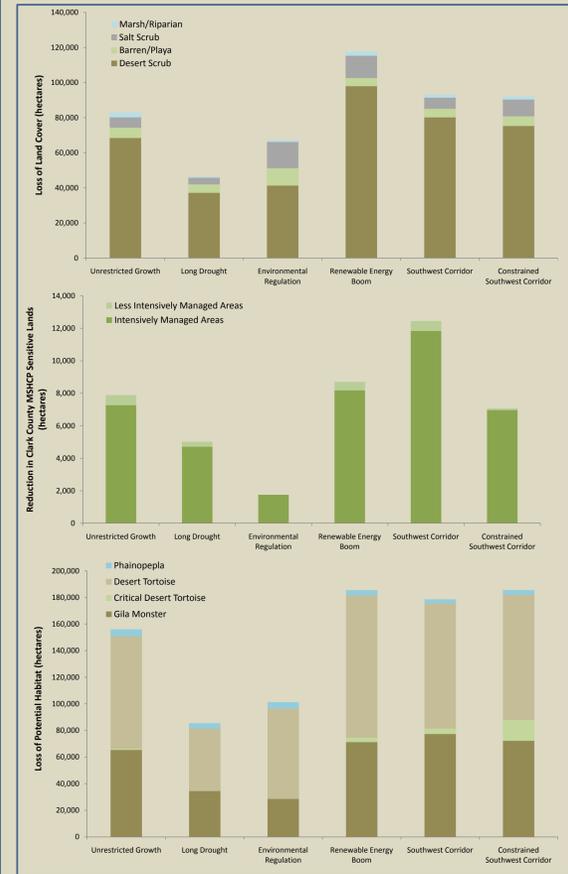
Rapid growth in the Las Vegas Valley from 1980 to 2005 resulted in extensive habitat loss, ultimately attracting public attention. New regulations and additional funding, combined with a slowed economy, led to major environmental restrictions throughout the valley. Clark County's MSHCP sensitive lands became protected from urban growth, and buffers were established around all specially-protected federal lands. Redevelopment is emphasized, as is renewable energy to support the valley.



Constrained Southwest Corridor

To protect against encroachment upon the Ivanpah Airport, development near the facility is constrained. Federal land surrounding the airport remains outside the BLM disposal boundary, protecting critical desert tortoise habitat as well as the long term viability of the Ivanpah Airport.

Biodiversity Impact Models and Results



Discussion

- The development and analysis of urban growth scenarios is an integral step in planning for future landscapes. This study has identified six scenarios of future urban development in the greater Las Vegas area. Because the scenarios were developed in part by regional and local stakeholders, their outcomes and impacts provide practicable information to be used for future decision making.
 - This process provides a regional approach to environmental management.
 - Developed futures encompass a broad range of possibilities.
 - Impact assessments illustrate the significance of today's policy choices upon alternative future patterns of development.
 - Limited private lands for development puts greater pressure on public lands.
 - Land use choices may affect habitat quantity and quality (biodiversity), air quality, surface and subsurface hydrology, and numerous other biophysical resources.
 - Assessing the cumulative impacts on the landscape (ie land use and climate change) can provide managers better insight into possible changes.
 - The results allow for dialogue and interaction among stakeholders.
 - Intersections of urban growth with priority areas for landscape conservation provide partnering opportunities to influence patterns of growth and mitigate ecosystem impacts.

Acknowledgements

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Socioeconomic Impact Models and Results

Scenario	Megawatt Capacity Increase	Water Use (acre-feet/yr)	Total Permanent Onsite Jobs	Rights-of-way (acres)
Unrestricted Growth	1,019	1,021	180	36,633
Long Drought	1,020	11	134	41,427
Environmental Regulation	3,220	618	429	63,427
Renewable Energy Boom	8,347	38,416	1,238	120,503
Southwest Corridor	2,227	625	340	37,783
Constrained SW Corridor	1,237	121	190	44,527

