Maximizing Sustainable Production: The Role of Wetlands in Regional Sustainability

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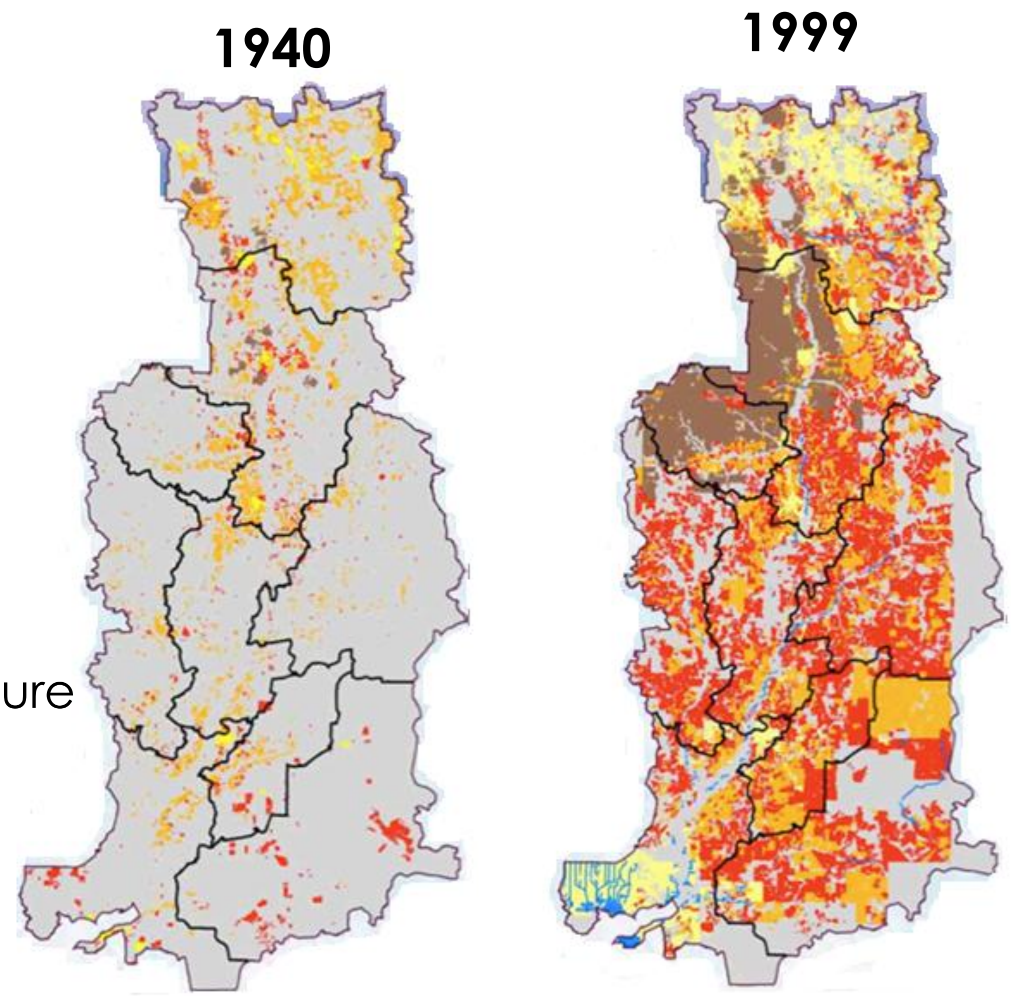
Problem Statement

- How can we predict a maximum sustainable production level within a regional watershed?
- Approach:
  - A question of sustainable scale involving both environmental and economic production
  - Model the regional product using a land use optimization approach
  - Incorporate ecosystem services as sustainability constraints

Peace River Region

- Peace River basin in southwest Florida
- Boundaries expanded to include entire county area
- Water use caution area
- Extensive phosphate mining within the watershed.

Land Use Change



Urban
Intensive Ag
Improved Pasture
Mining

1940 1999

1% - 10% Urban
8% - 17% Intensive Ag
3% - 27% Improved Pasture
.5% - 10% Mining

Peace River Cumulative Impact Study, 2007. FDEP

Methods

- Regional EIO-LCA Model
  - IMPLAN regional economic model baseline
  - Development of regional resource intensity vectors using public data
  - Accounts for both direct and indirect impacts
- Land Use Optimization Model
  - Collapse industries to major land uses
  - Separate out indirect inter-industry impacts
  - Use average environmental water and energy budgets for land uses

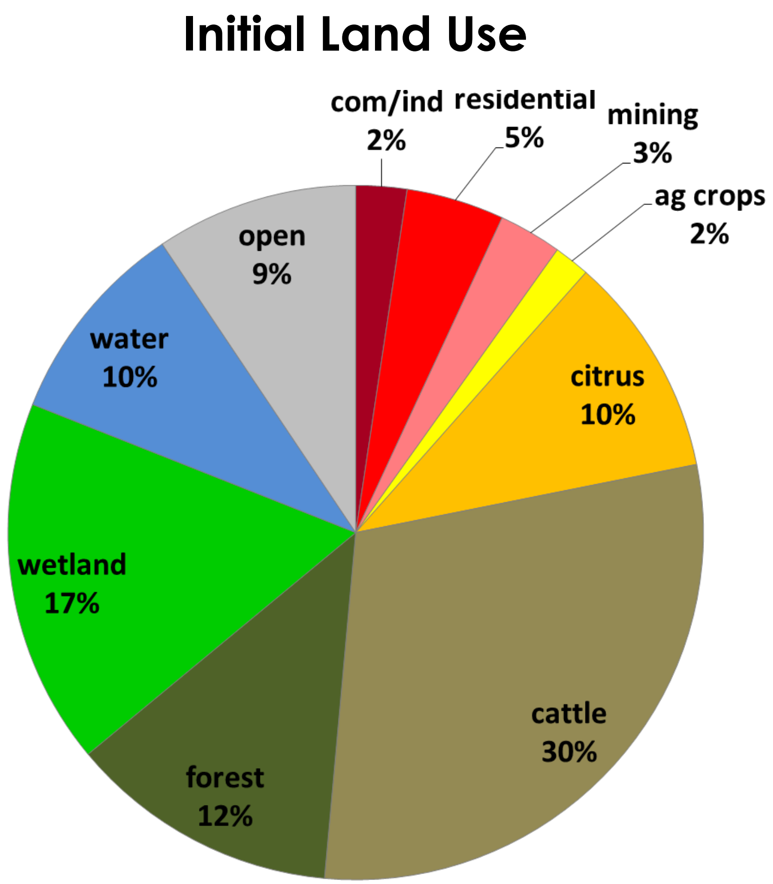
Sustainability Constraints

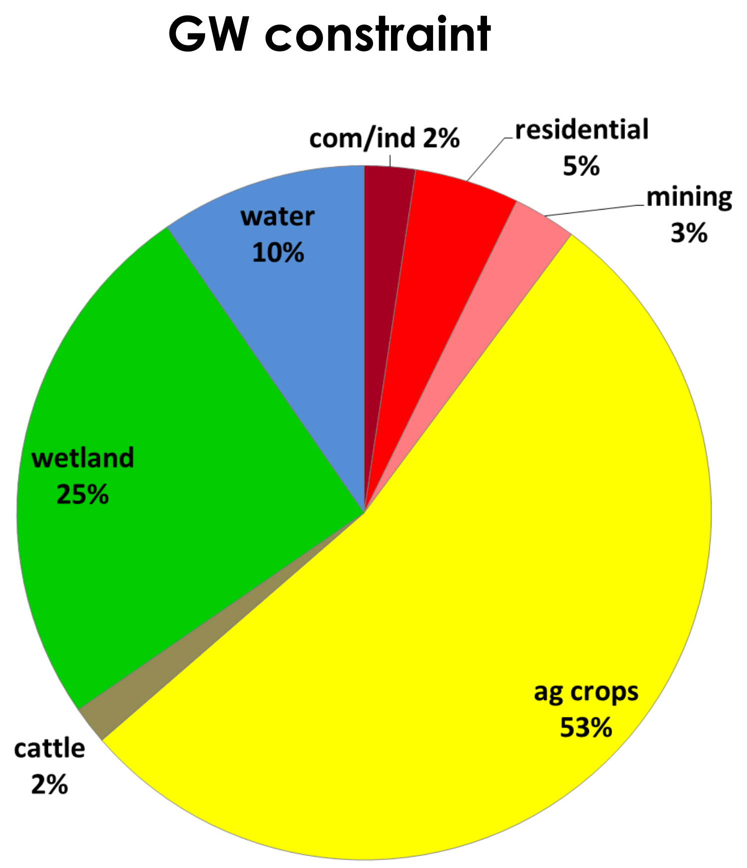
- Groundwater balance
  - Based on minimum flows and levels
- Storm runoff storage
  - Based on 24 hour 25 year return storm
- GHG emissions
  - Based on meeting Kyoto protocol reduction targets
- Renewable energy
  - Based on proposed renewable energy standard and RFS

Focusing on the Role of Wetlands

- How do wetlands provide value in the regional production system?
- Value is defined as an increase in the optimization goal

Run 1: Ground Water Constraint

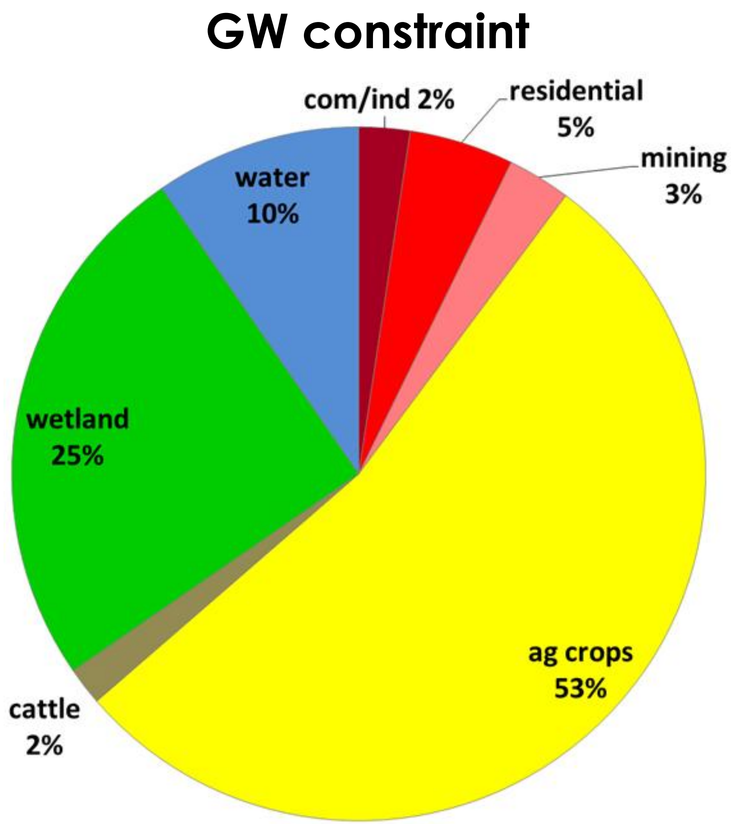




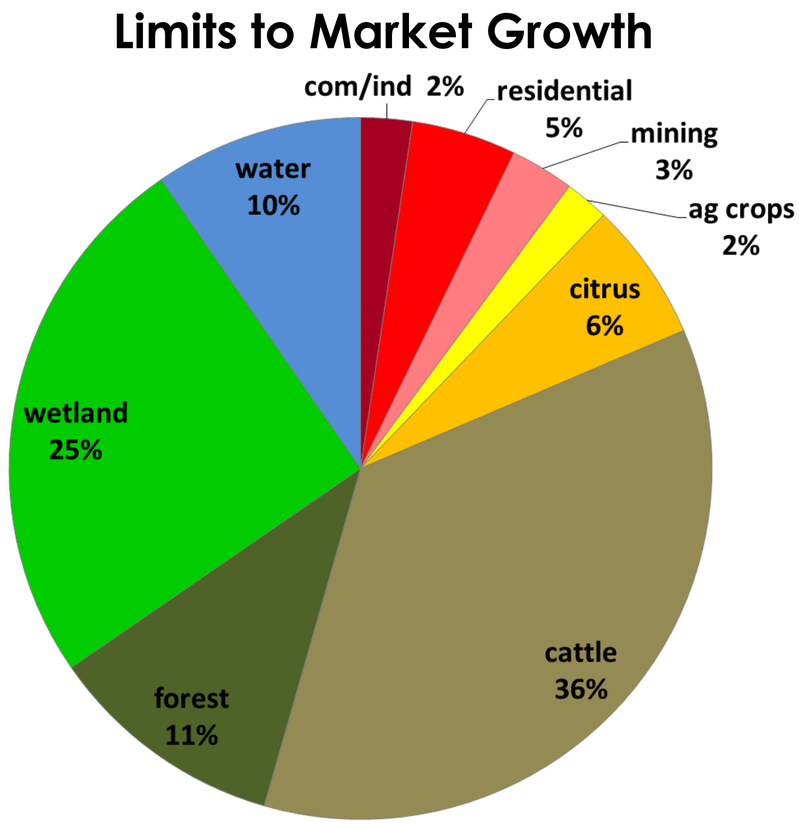
Total Output: $M 26,271

Total Output: $M 27,791

Run 2: Market Growth Limits

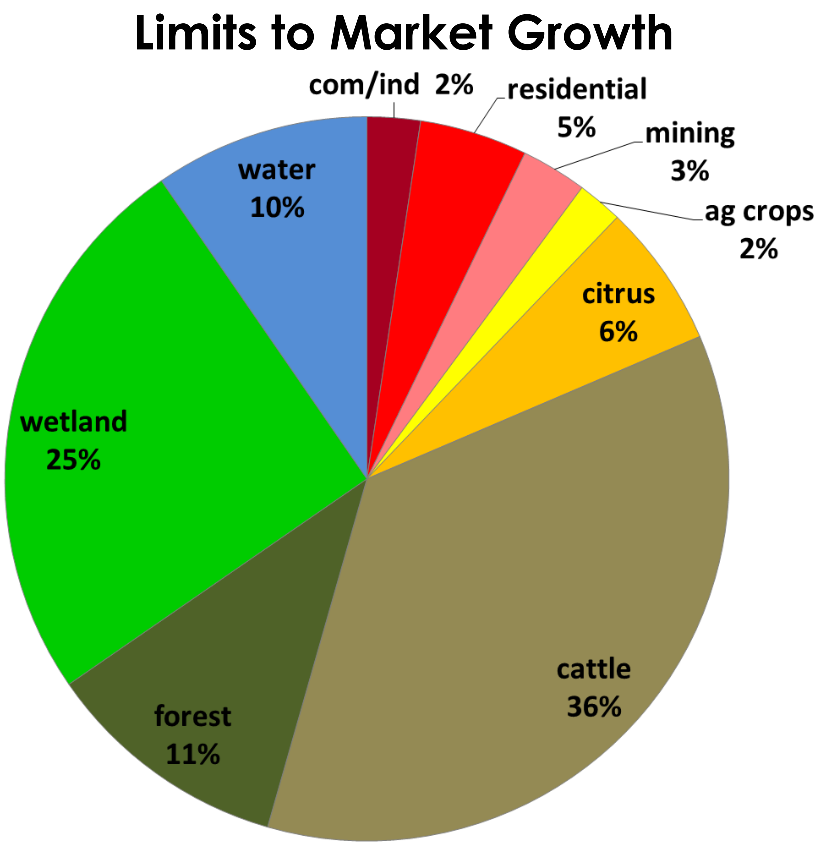


Total Output: $M 27,791

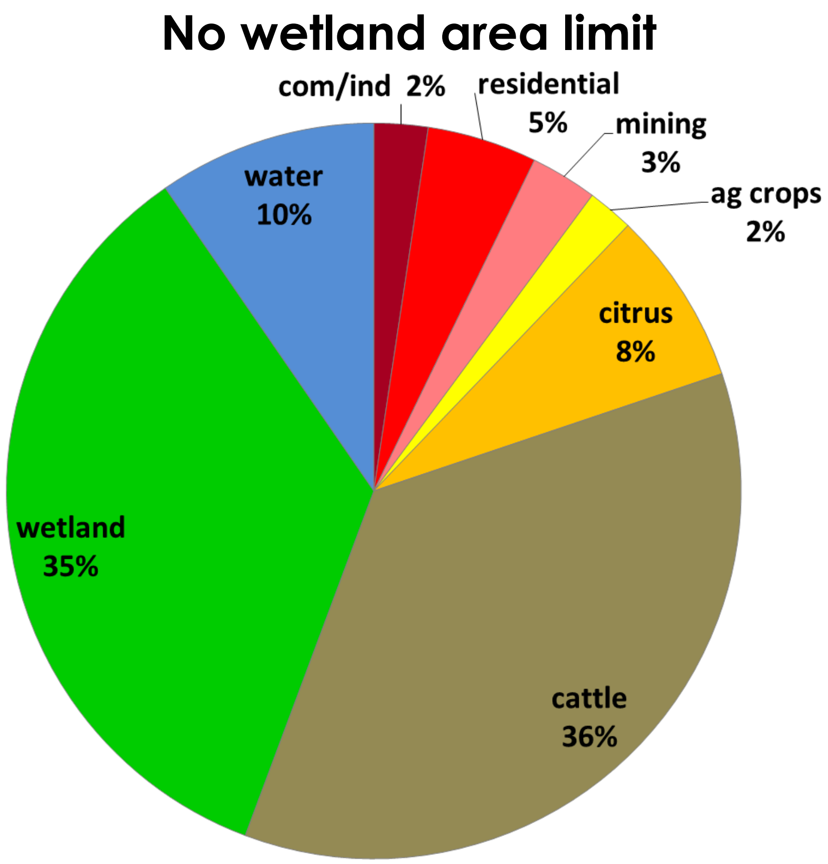


Total Output: $M 26,612

Run 3: No Wetland Area Limit

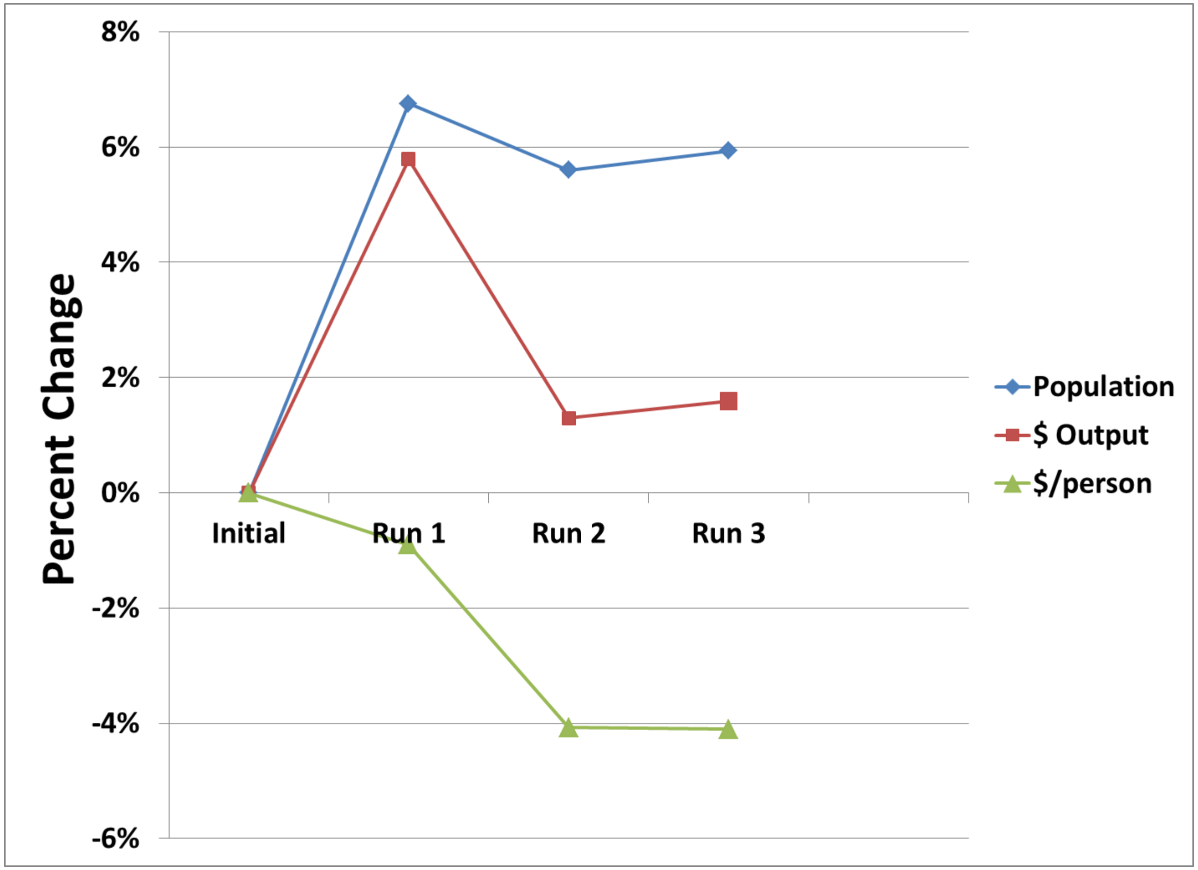


Total Output: $M 26,612



Total Output: $M 26,688

Regional Impact



Discussion

- Wetland area increases to provide sustainable ground water recharge
- The region appears to be close to the maximum production level already
- An implementation of this model could be used to test future development scenarios

Acknowledgements

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