10. What is Needed for a Successful LEMA?

Nathan Hendricks **<nph@k-state.edu>**

Nathan Hendricks is an Assistant Professor in Agricultural Economics at Kansas State University. He holds B.S. and M.S. from KSU and a Ph.D. from University of California, Davis. His research analyzes agricultural supply response and the effect of agricultural and environmental policies. His previous research has investigated agricultural supply dynamics, the cost-effectiveness of alternative water conservation policies, and the production effects of agricultural domestic support programs. He teaches an undergraduate course on international and environmental issues in agriculture, a graduate course on agricultural policy, and a graduate team-taught course in quantitative methods.

Abstract/Summary

I will discuss the conditions under which reductions in water withdrawals lead to long-run economic benefits and the conditions that make a proposed LEMA (Local Enhanced Management Area) more likely to be supported by local water users. The discussion will focus on general principles identified by the social science literature with application to Kansas groundwater management. Types of issues that will be discussed for a successful LEMA include identifying policy boundaries, alternative forms of water use restrictions, monitoring, and sanctions. Rather than offering specific recommendations, the purpose of this session is to encourage careful consideration of different aspects of any LEMA. Discussion among session participants is highly encouraged.

What is Needed for a Successful LEMA?

Nathan P. Hendricks
2015 Risk and Profit Conference
Kansas State University

"Successful"

What I mean…

Obtaining substantial support for the policy by local water users.

My goal is NOT to answer

- *Should* we reduce groundwater withdrawals?
- If so, how much *should* we reduce withdrawals?

My goal is to answer

If the goal is to reduce water use through a local initiative like a LEMA or Water Conservation Area (WCA), then what are important design considerations that will help garner the most support among local water users?

Not a Unique Problem to Kansas or Irrigation

- Local communities managing a fishery or forest
- Countries negotiating international environmental agreements
  - Ex. Montreal Protocol on Substances that Deplete the Ozone Layer

Part I. The Challenge of Managing Groundwater

External Costs of Pumping

A cost imposed on others from my action

1. Extraction by one user reduces water available for other users
2. Extraction by one user increases depth to water for other users and thus increases cost of pumping
3. Extraction by one user reduces the well capacity for other users

KANSAS STATE UNIVERSITY

The Problem

- An irrigator has no incentive to consider external costs, only private costs
- Could lead to excessive extraction (i.e., Tragedy of the Commons) – "If I don't pump it then someone else will"
- Are farmers hopelessly caught in the tragedy?
  - Assumes only self-interested and no communication

KANSAS STATE UNIVERSITY

The "Solution"

- Farmers suffer the costs of excessive extraction so they have an incentive to collectively manage the groundwater to maximize net benefits over time
- Come to an agreement so that ALL costs are considered when determining extraction rates – in theory, everyone can be made better off

KANSAS STATE UNIVERSITY

The Challenge of Collective Action

- Everyone has an incentive to free ride
- Free rider enjoys reduced withdrawals by others without reducing his or her own withdrawals
- Benefits>Costs for collective action?

KANSAS STATE UNIVERSITY

Caveat

- I am presenting the standard economic rationale for intervention
- This presentation does not argue whether these external costs are large or small

KANSAS STATE UNIVERSITY

LEMA and WCA Overview

KANSAS STATE UNIVERSITY

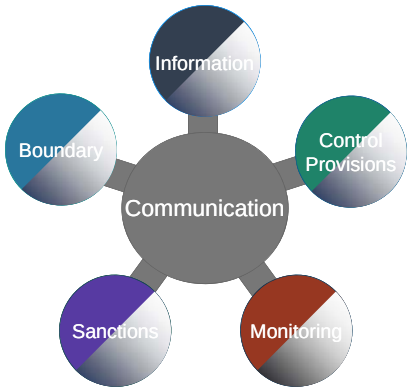
Local Enhanced Management Area (LEMA)

- Submitted by GMD
  - No vote of local water users is necessary
  - GMD Board is elected and public hearings for proposed LEMA are conducted
- LEMA proposal includes
  - Corrective provisions (e.g., restrictions on withdrawals)
  - Monitoring and enforcement mechanisms
- Enforced by GMD and DWR

Water Conservation Area (WCA)

- Authorized by legislature in 2015
- Submitted by group of water right owners
- 100% voluntary

Part II. Design Considerations for a LEMA or WCA



Information

- Reliable predictions of the consequences of alternative actions
- An understanding of how one user's pumping affects other users
- Reliable and valid indicators of the status of the aquifer at a scale applicable to users

Choosing the Size of the Management Area

- Advantages of a large management area
  - More of the benefits of conservation retained within the area
  - Fewer fields near policy boundary
  - Can reduce cost of establishing LEMA (fewer meetings and hearings)
- Disadvantages of a large management area
  - More heterogeneous conditions and users means it can be more difficult to garner support

The Problem of Boundaries in an Aquifer

- Water doesn't stay within policy boundaries (though lateral flows are quite slow)

Hypothetical Example

Potential Solution to Boundaries

- Divide large region into smaller management areas
- Each management area could have different goals
- If goals are not drastically different, then minimal impact of being near a boundary

Alternative Forms of Restrictions

- Uniform quantity restriction
- Percent reduction from historical use
- Spatially varying quantity restriction based on climate
- Water pricing

Uniform Quantity Restriction

- Ex. 55 inches/acre over 5 years
- Need a small management area

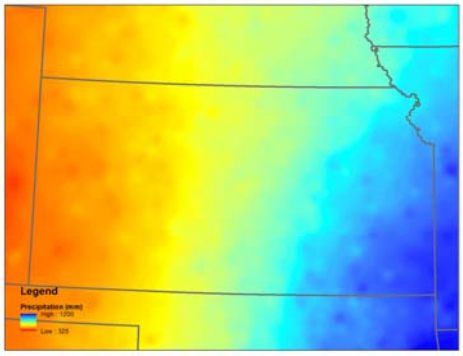
Percent Reduction from Historical Use

- Allows restriction to vary across space according to climate and hydrologic characteristics
- Calculate historical use from most recent period - creates incentive to pump more before restriction is in place
- Calculate historical use from an early period – may not reward previous conservation efforts
- Calculate average historical use from an early period from all neighbors within a certain radius

Spatially Varying Quantity Restriction

- Previous restrictions (i.e., Walnut Creek IGUCA) specify different quantities by county
- Could link restriction to fine-scale weather data
- Economically optimal reduction also depends on hydrologic characteristics, but that may be more difficult to incorporate into a formula

Average Annual Precipitation (mm)



Source: PRISM

Water Pricing

- Creates incentive to use less water
- Allows variability in quantity of pumping
  - Those that derive more value from the water will pump more
- May be easier to agree on a single price than varying quantities
- Revenues could be redistributed to water users

Flexibility in Use

- Flexibility in use across years
- Flexibility in use across fields and users (i.e., facilitate trading)
- Can offset much of the short-run economic losses

Graduated Sanctions

- Small penalties for small infractions
- Water users will be more willing to support a restriction in an uncertain world
- More likely that penalties will be enforced
- Continued infractions result in larger penalties

Example of Graduated Sanction

- Restrict water use to 50 inches over 5 years
- Can pay $x fine to use 55 inches over 5 years
- Can pay $(x+y) fine to use 60 inches over 5 years
- Fines could be redistributed to other water users based on their proportion of initial irrigated acres within the area. Even if some users violate agreement, the compliers still benefit.

Using Sanctions to Induce Purely Voluntary Participation

Two options

1. Penalize non-participants
2. Create escape clause
   - Allows users to not comply if pay a penalty

Example of an Escape Clause

- First stage, voluntarily agree to join management plan with escape clause
- Second stage, the members decide on control provisions
  - Members can pay the fine (escape clause) to not abide by agreement
  - Fines are redistributed among compliers of the agreement

Monitoring

- Relatively straightforward with water meters
- But still important considerations to ensure no cheating

KANSAS STATE UNIVERSITY

KANSAS STATE UNIVERSITY

Communication

- Leadership
- Shared goals
- Open dialogue
  - GMD can facilitate discussions to reduce cost of setting up management area (i.e., time, travel, and inconvenience)
  - One-size provisions may not fit all
  - Be open to creative solutions
  - Adapt to changes
- Trust among water users

KANSAS STATE UNIVERSITY

Conclusion

- Collective (local) management of groundwater that leads to greater long-run economic benefits is possible

1. Learn from previous work
2. Design matters
3. Hard work to deal with a complex issue

KANSAS STATE UNIVERSITY

Nathan Hendricks

Phone: (785) 532-3740
Email: nph@ksu.edu
Twitter: @nphendricks

KANSAS STATE UNIVERSITY