

Implementation and Maintenance of WQ BMPs

A sociological study of cooperator behavior in the Little Bear River watershed

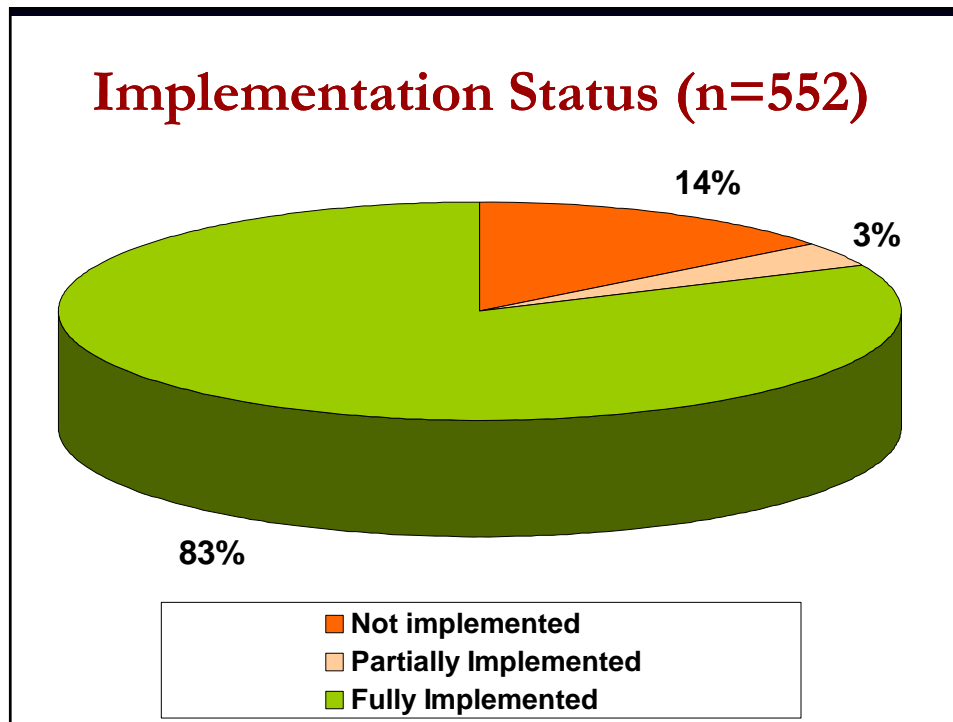
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Analysis Approach

- Sample = Interviewed Farms/Landowners
- Start with database of ALL contracted BMPs on these farms
- Code each BMP practice for
 - Implementation Status (was it put in place?)
 - Maintenance Status (is it still there?)
- Analysis at both
 - Practice level
 - Farm level

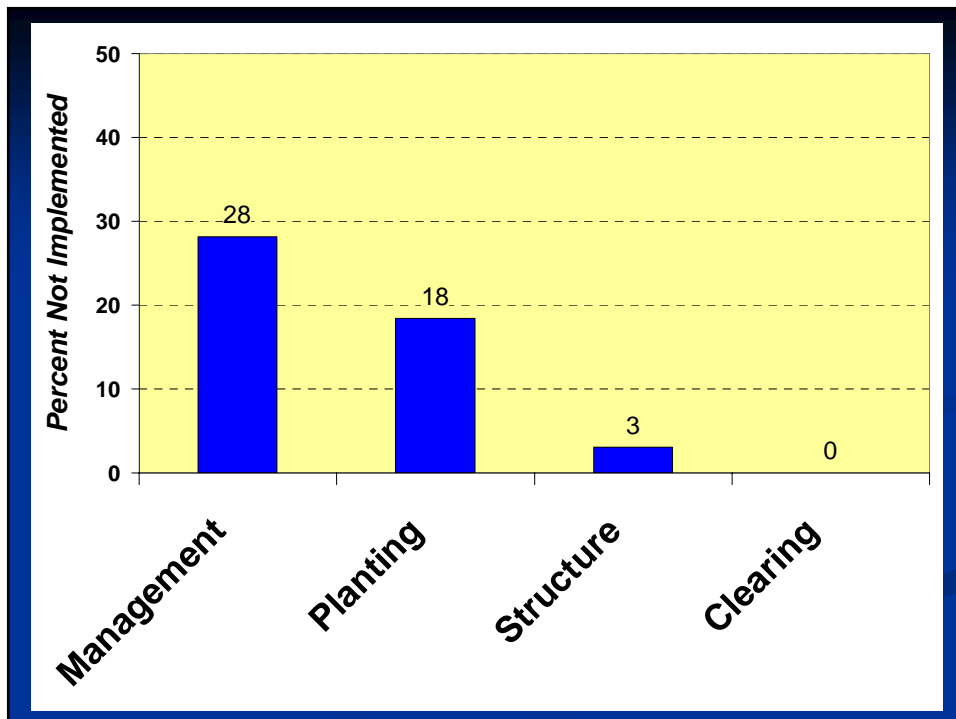


Farm-Level Implementation (n=54)

- 37% (20) fully implemented all practices
 - 37% (20) fully implemented 75-99%
 - 19% (10) fully Implemented 50-74%
 - 7% (4) fully implemented <50%
- **In other words, ~63% had at least one practice that was not fully implemented**

Does BMP Practice **Type** Matter?

- **STRUCTURES (35% of all practices)**
 - fences, waste storage facilities, sprinklers, etc...
- **MANAGEMENT (47%)**
 - Irrigation water management, nutrient management, waste utilization, etc...
- **PLANTING (16%)**
 - planting grasses, filter strips, trees, etc...
- **CLEARING (2%)**
 - Clearing and snagging, land clearing, etc...



Reasons for Not Fully Implementing Practices

- No recollection of agreeing to do it, or discussing it with NRCS employee (46%)
- Ignored the advice that was given (15%)
- Tried to implement but practice failed (9%)
 - *nearly all planting practices*
- Did not meet our research team's interpretation of objective (31%)
 - *Did an associated practice, but not this one (22%)*
 - *Partial implementation (9%)*

| Logistic Regression Model for Implementation | | | | | | | |
|--|---------|-----------|---------|-----------|----------------|------------|--|
| Independent Variables | Model 1 | | Model 2 | | Complete Model | | |
| | B | Exp(B) | B | Exp(B) | B | Exp(B) | |
| Practice Type | | | | | | | |
| Structure | 3.609 | 36.915*** | 4.397 | 81.191*** | 4.839 | 126.359*** | |
| Planting | 0.945 | 2.573* | 0.941 | 2.563* | 0.892 | 2.441* | |
| Clearing (Management) | 20.622 | 9.04E+08 | 21.229 | 1.66E+09 | 21.417 | 2E+09 | |
| Farm Characteristics | | | | | | | |
| Age 55 and Older | | | -1.809 | 0.164*** | -1.936 | 0.144*** | |
| >100 acres | | | 0.832 | 2.297*** | 1.336 | 3.805** | |
| Successor (1=Yes) | | | 0.654 | 1.923 | 1.411 | 4.099** | |
| Dairy (1=Yes) | | | -1.627 | 0.197*** | -1.100 | 0.333** | |
| FarmDependence | | | 0.600 | 1.822 | 0.143 | 1.154 | |
| Rent (1=Yes) | | | 0.427 | 1.532 | -1.007 | 0.365* | |
| Motivation | | | | | | | |
| Environmental | | | | | 2.224 | 9.246*** | |
| -2 Log likelihood | 313.52 | | 266.86 | | 244.68 | | |
| Nagelkerke R Square | 0.27 | | 0.42 | | 0.49 | | |

*= p<.05, ** p<.01, and ***p<.001

Factors Associated with HIGHER Implementation Rates

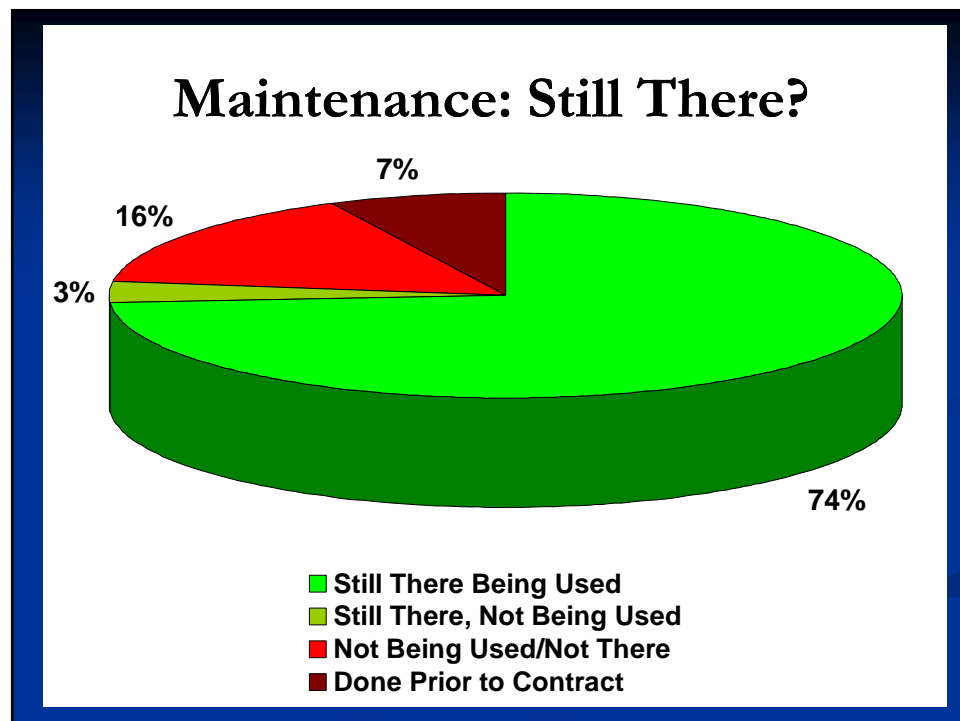
- Structure & Planting Practices (contrasted with Management)
- Younger operators
- Larger acreages
- Farms with successors
- Non-dairy operations
- Owned land
- Environmental motivations

Interpreting Low Implementation

- Caution required
 - Recall errors? – up to 14 years ago
 - Not necessarily mean nothing done
 - NRCS Staff might tell different story
 - Not evidence of malfeasance or illegality

Maintenance

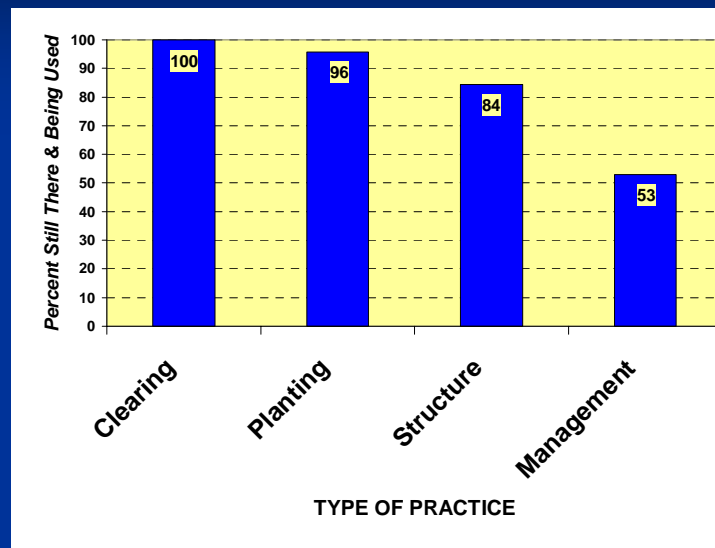
- Practices that were never implemented cannot be maintained, so were removed from analysis (n=97)
- Maintenance status of 16 practices could not be identified (interview cut short, or we did not ask)
- 432 usable practices evaluated to see if they are “STILL THERE”



Farm Level (N=53)

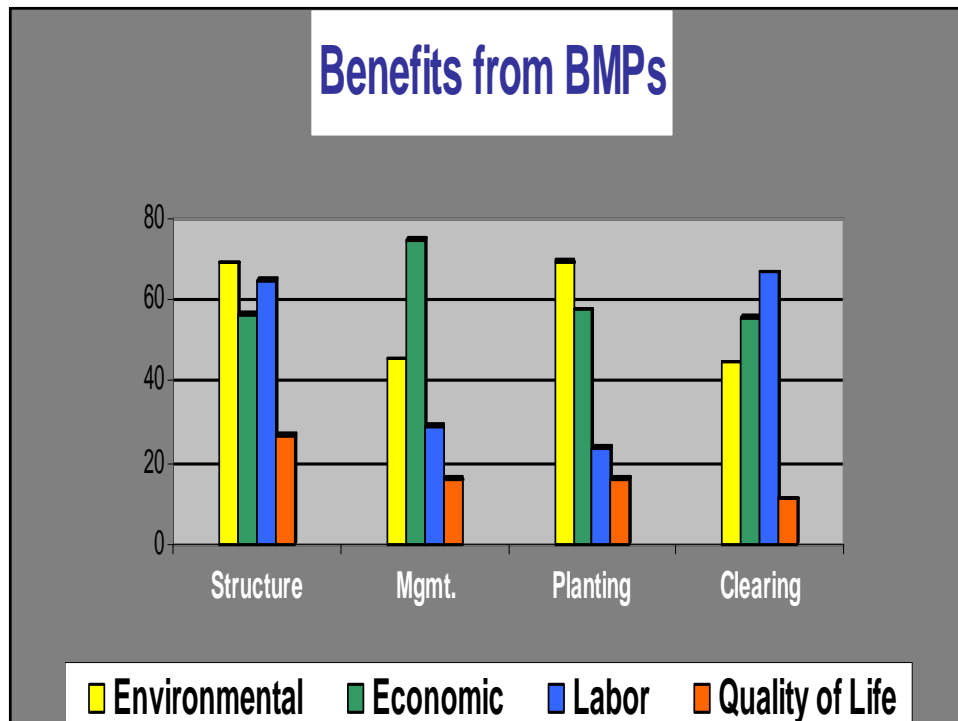
- 40% (21) maintained all practices
 - 21% (11) maintained 75-99%
 - 21% (11) maintained 50-74%
 - 19% (10) maintained < 50%
- **In other words, 60% had at least 1 practice that was no longer being maintained or used**

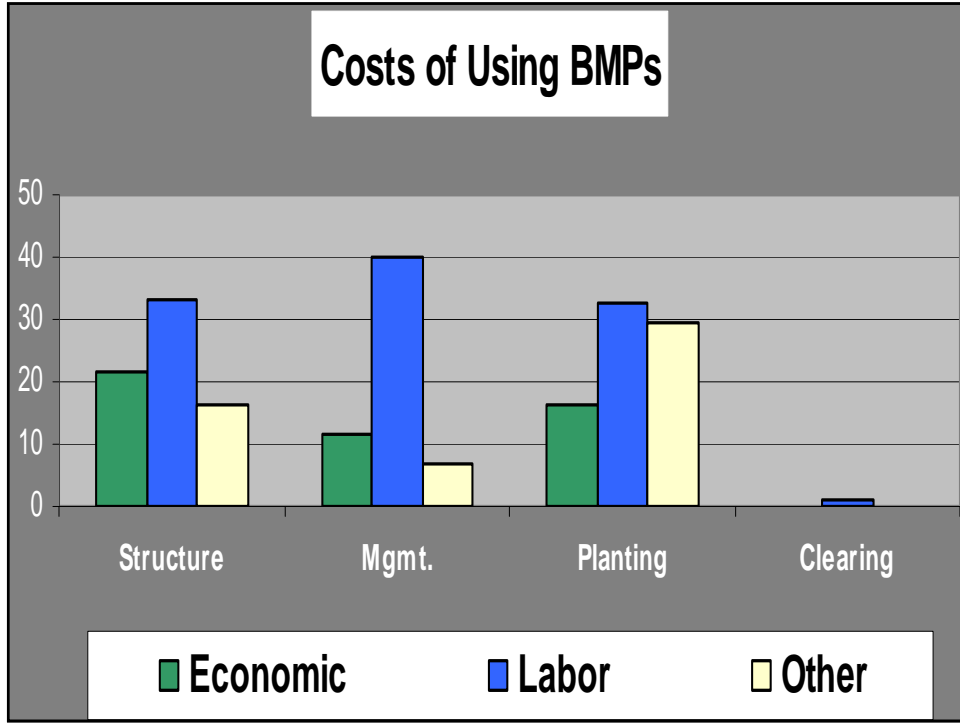
Maintenance by Practice Type



Reasons for Discontinuance

- Undone by farm changes, usually downsizing (N=35)
 - ½ of these converted to development (n=17)
- Temporary Practice (N= 27)
- Broke, or “undone” by natural events (N=10)
- New structures replaced old structures (N=7)
- Producer no longer wanted to do it (N=7)
 - all management practices





| Independent Variables | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-----------------------------|----------|--------|----------|--------|----------|--------|-----------|--------|
| | B | Exp(B) | B | Exp(B) | B | Exp(B) | B | Exp(B) |
| Practice Type | | | | | | | | |
| Structure | 0.902** | 2.464 | 0.854* | 2.349 | 0.675* | 1.965 | 0.704 | 2.022 |
| Planting | 2.205*** | 9.074 | 2.357*** | 10.559 | 2.278*** | 9.759 | 2.243*** | 9.421 |
| Clearing | 20.615 | 9E+08 | 20.615 | 9E+09 | 20.357 | 2E+08 | 20.792 | 1E+09 |
| Farm Characteristics | | | | | | | | |
| Age 55 and Older | | | -0.085 | 0.918 | -0.203 | 0.817 | 0.106 | 1.112 |
| >100 acres | | | 0.014 | 1.014 | -0.257 | 0.773 | -0.178 | 0.837 |
| Successor (1=Yes) | | | 0.138 | 1.148 | -0.293 | 0.746 | -0.396 | 0.673 |
| Dairy (1=Yes) | | | 0.305 | 1.357 | -0.095 | 0.909 | -0.085 | 0.919 |
| FarmDependence | | | 1.367** | 3.924 | 1.747*** | 5.737 | 2.013*** | 7.488 |
| Rent (1=Yes) | | | -0.340 | 0.712 | 0.509 | 1.663 | 0.929 | 2.531 |
| Motivation | | | | | | | | |
| Environmental | | | | | -1.093** | 0.335 | -1.739*** | 0.176 |
| Costs and Benefits | | | | | | | | |
| Economic (+) | | | | | | | -0.103 | 0.902 |
| Labor (+) | | | | | | | -0.672 | 0.511 |
| QualityofLife (+) | | | | | | | 0.163 | 1.177 |
| Environmental (+) | | | | | | | 1.157** | 3.180 |
| Economic (-) | | | | | | | 0.131 | 1.139 |
| Labor (-) | | | | | | | 0.408 | 1.504 |
| Quality of Life (-) | | | | | | | -2.894* | 0.055 |
| -2 Log likelihood | 288.28 | | 274.88 | | 268.10 | | 250.52 | |
| Cox & Snell R Square | 0.09 | | 0.13 | | 0.15 | | 0.19 | |
| Nagelkerke R Square | 0.13 | | 0.19 | | 0.22 | | 0.30 | |

*p<.05, **p<.01, ***p<.001

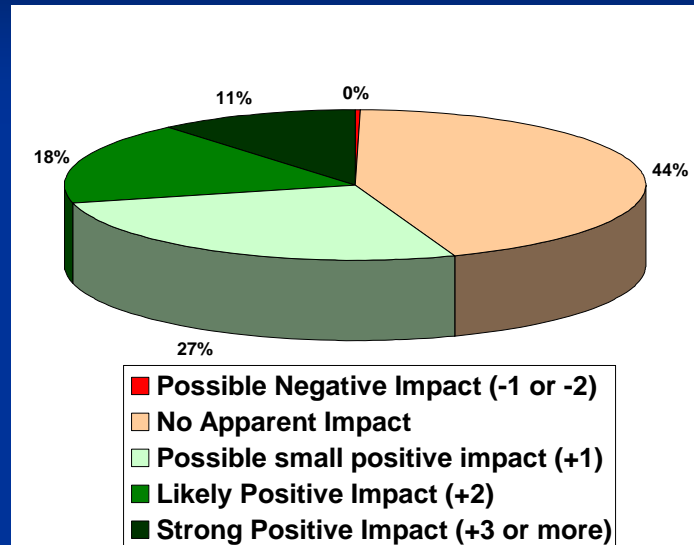
Factors Associated with HIGHER Maintenance Rates

- Structure & Planting Practices (contrasted with Management)
- Dependence on Farm Income
- LOWER environmental motivations
- Perceived environmental benefits
- NO negative impacts on Quality of Life

Estimated Water Quality Impacts

- Rated each practice based on
 - Maps & field observations
 - Evaluate possibility that changes could affect surface runoff into Little Bear River during time frame
 - Producer input
 - What did they think was water quality impact
 - Did they see any changes?
- Scale Scores ranged from -5 to +5
 - Negative to Positive impacts (0 = neutral)

WQ Impacts of Practices (among those implemented)



Summary: Implementation

- Management practices = Low implementation
- Farm characteristics influenced the implementation process
- Motivations for participating influenced implementation
- Many producers were not aware that they were supposed to implement certain practices, or believed they were, though we determined they were not.

Summary: Maintenance

- Management Practices had highest rates of discontinuance, BUT—majority of these were “temporary practices”
- Removing these, structures had the highest rates of discontinuance
- Farm characteristics not as important (except farm dependence)
- Costs and Benefits had little to do w/ maintenance
- Farm changes were the most common explanations

Implications: Implementation

- Management practices are the heart of conservation programs
 - Failure to fully implement may have huge impacts on success
- Big Question: How can management behaviors be implemented more effectively?

Implications: Maintenance

- Good news:
 - Other than a small handful of management practices, producers did not discontinue the practices because they did not like them
- Not so good news:
 - The most commonly discontinued structures were some of the most expensive projects to implement (waste storage facilities, fences, and sprinkler systems)
- Nonfarm Development and Farm Changes are significant forces
- Will it be cost-effective in the long run?