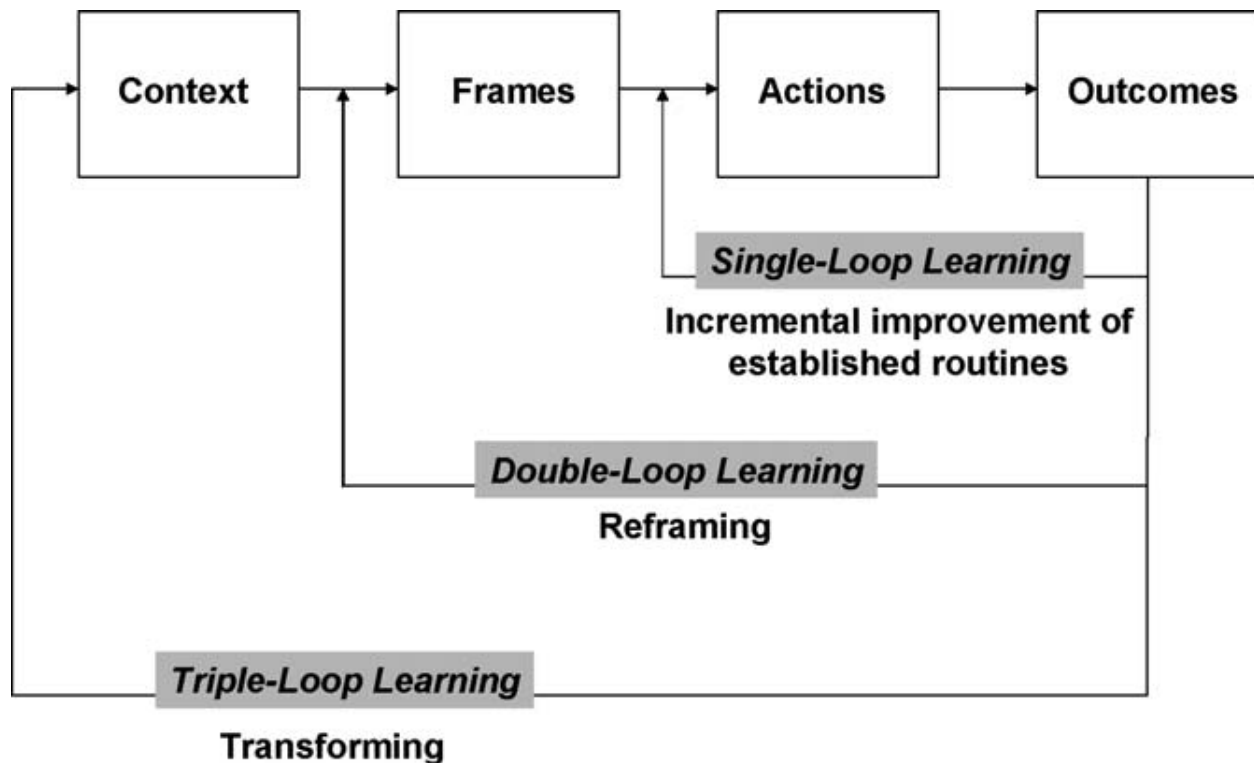1   **Adaptive Harvest Management:**

2   **Lessons Learned and Prospects for the Future**

3

4   **Prepared by the Harvest Management Working Group**

5   **December 10, 2013 *DRAFT***

6

7   The adaptive management of waterfowl harvests in the United States has endured as an institution for

8   almost 20 years. The U.S Fish and Wildlife Service adopted a framework for adaptive harvest

9   management (AHM) in 1995 after a controversial regulatory experiment, an unpopular Environmental

10   Impact Statement, and a period of restrictive hunting regulations had severely eroded the collegiality

11   important to collective decision-making. Today, AHM remains one of the few large-scale, successful

12   efforts to apply the principles of adaptive resource management. Much has been learned about the

13   harvest potential of waterfowl populations, the ability of managers to regulate harvest, and the

14   monitoring and assessment programs needed to support an adaptive process of decision making. In the

15   long run, however, perhaps one of AHM's greatest contributions will be in its capacity to compel

16   managers to periodically reexamine their purposes and rules of operation. Referred to as double- and

17   triple-loop learning (Fig. 1), this critical self-examination is usually precipitated by an institutional

18   recognition that current operating premises and protocols are inadequate to address unanticipated

19   problems that arise in management policy. These problems emerge because performance expectations

20   are not being met, because the beliefs underlying those expectations change, or because expectations

21   were unrealistic to begin with. This type of social learning is difficult because institutions have to

22   acknowledge deficiencies in their processes and policies and because the search for solutions usually

23   causes conflict. This is where the management enterprise now finds itself, and the key challenge facing

24   harvest management is whether AHM as an institution can be adaptive, and whether the knowledge and

25   experience gained in the application of AHM can be reflected in higher-level policy decisions.

26

27   Although AHM has improved our understanding about the potential of duck populations to support

28   harvest, most of the keys lessons learned concern the process itself. These lessons involve the

29   establishment of harvest-management goals and objectives, our ability to regulate harvests, and the

30   difficulties associated with harvesting multiple stocks of ducks that are exposed to a common sport
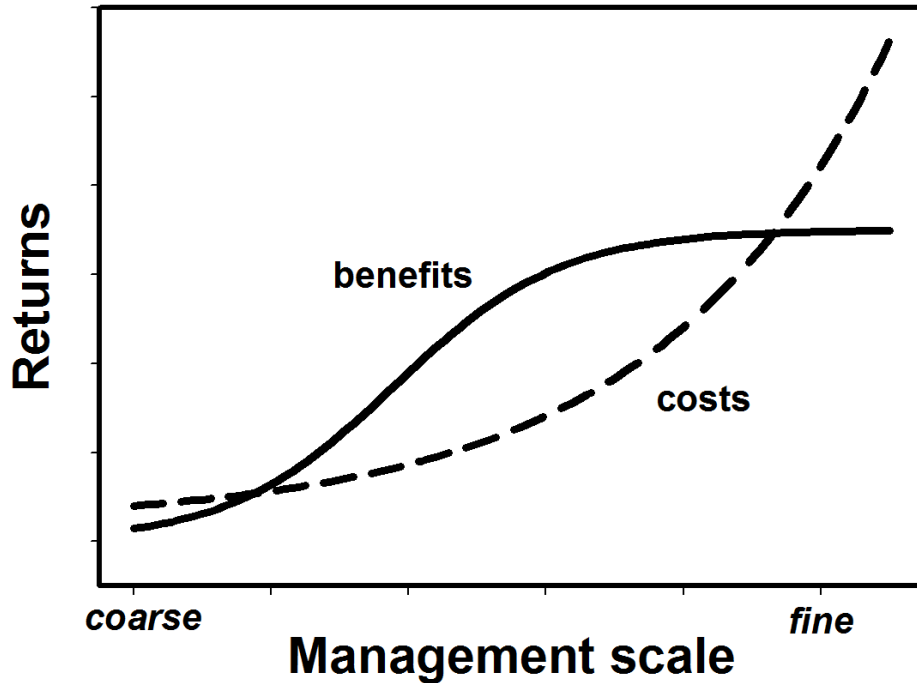
31   harvest:

32

33   • Goal setting
34   o Building models is easier than setting objectives, which reflect social values
35   o Harvest is not necessarily a good measure of hunter satisfaction
36   o Liberal regulations, even for long periods of time, won't necessarily sustain hunter numbers
37   o The lack of understanding about what satisfies and motivates waterfowl hunters makes it
38   difficult to specify social objectives and relevant metrics
39   o There are limited institutional arrangements or processes for productively discussing
40   objectives

Context → **Frames** → **Actions** → **Outcomes**

Single-Loop Learning

Incremental improvement of established routines

Double-Loop Learning

Reframing

Triple-Loop Learning

Transforming

Fig. 1. Three types of learning in management institutions. The updating of model weights and harvest policies in AHM is characteristic of single-loop learning. Single-loop learning involves asking "Are we doing things right?" Double-loop learning involves the revision of management objectives, regulatory alternatives, or predictive models within the context of an established process. Double-loop learning involves asking "Are we doing the right things?" Triple-loop learning involves a fundamental transformation of the management framework, including institutional arrangements and processes (e.g., the integration of harvest and habitat management). Figure reproduced from Pahl-Wostl, C. 2009. A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. Global Environmental Change-Human and Policy Dimensions 19:354-365).

- Limits to regulating harvests
  - Regulatory alternatives are social constructs with only some biological and legal constraints
  - Large differences in regulations can result in only small differences in harvest rate, and this can lead to so-called knife-edged strategies (i.e., those in which a large regulation change can accompany only a small change in resource status)
  - We face severe constraints on our ability to direct species-specific harvests
  - Our ability to regulate harvests only within limits (i.e., partial controllability) imposes significant constraints on short-term performance and learning

- Sources of variation in harvest potential
  - Harvest potential varies over space, time, and organizational/functional (e.g. species) scales

64   o   Our ability to capitalize on it is severely constrained by limits on monitoring & assessment
65   capacity, as well as traditional regulatory tools available to managers
66   o   In an ideal world, we would define the appropriate scales of management based on the
67   largest net benefit in terms of population and harvest objectives; in reality, we are likely
68   constrained to course-scale management by the resources available (Fig. 2)
69

70
71   **Fig. 2.** *Conceptual representation of how management returns (benefits and costs) are expected to*
72   *change with the scale or resolution of management. A fine scale of management involves attempting to*
73   *target harvests for multiple species, populations, and geographic areas, and is characterized by a high*
74   *degree of regulatory complexity.*
75
76   Despite a growing acceptance of these lessons, the harvest management community has found it
77   difficult to incorporate them into the institutional structure and functioning of the AHM process.
78   Moreover, the Working Group has identified a number of emerging concerns about the inability of the
79   AHM process to cope with changing institutional conditions:
80
81   •   The Supplemental Environmental Impact Statement will fundamentally affect the way we make
82   decisions, and may well have unanticipated effects on management programs and institutions
83   •   Harvest and habitat management need to be integrated (or at least not working at cross purposes)
84   as described in the most recent revision of the North American Waterfowl Management Plan
85   •   We are losing the traditional base of support, as well as strong leadership, for waterfowl
86   management

87 • Resources available for waterfowl management are shrinking and it will be difficult to maintain even
88   the status quo in terms of monitoring and assessment programs
89 • The gap between technical and practical expertise has grown and practitioners feel increasing
90   alienated from the process
91
92 The Harvest Management Working Group believes that the AHM process is on an unsustainable path in
93 terms of cost and complexity. The Group also believes that the process has become overly cumbersome
94 and rigid, and that it lacks the adaptive capacity to cope with a changing institutional environment. This
95 is not really surprising, given that most human institutions (and ecosystems) go through cycles of
96 efficiency, crisis, and renewal. As harvest managers contemplate the ways AHM might be re-invented to
97 address these concerns, the Working Group suggests several key questions to be considered:
98
99   • How do we expand the discussion to address the integration of population, habitat, and hunting
100   objectives? Are objectives about maximizing or about satisficing (i.e. would objectives that were
101   intended to achieve satisfactory levels of performance in most years lead to a simpler, more flexible
102   process)?
103 • In dealing with uncertainty, are adaptive or robust approaches more appropriate? Robust
104   approaches are intended to produce an acceptable level of performance regardless of key
105   uncertainties, and are generally less demanding of monitoring and assessment resources
106 • At what spatial, temporal, and organizational scales do we wish (or are we able) to manage
107   harvests? Might a formal multi-species approach (rather than mallard-centric) at the flyway level
108   alleviate some of the concerns of harvest managers?
109 Finally, the Working Group urges the management community to more explicitly consider its risk
110 tolerance. Generally, objectives in AHM have been cast as risk-neutral, in that the perceived value of
111 management increases proportionally with some metric of performance (e.g., harvest) (Fig. 3). How
112 might the attitude toward risk vary depending on the various metrics of performance (e.g., population
113 size, harvest, hunter participation), as well as the life history of the species, the level of interest among
114 hunters, the ability to regulate harvest, and the degree of uncertainty? Understanding managers' risk
115 tolerance is reflected in many (all?) elements of the decision-making process, including specification of
116 the objectives, the regulatory alternatives, the models of population dynamics, and the approach to
117 optimization (e.g., robust vs. adaptive). Fortunately, the role of risk tolerance is well-established in
118 decision analysis (principally in business; less so in conservation) and, over the next year, the Working
119 Group intends to explore its application in AHM.
120
121 In conclusion, we would like the harvest-management community to know it's time to ask what we wish
122 AHM to look like in the future. There is nothing in the SEIS that precludes this discussion, aside from the
123 timing of the annual regulatory decision. The Working Group is anxious to engage both federal and
124 state partners in this endeavor, recognizing that any new direction will require a sense of ownership on
125 the part of all partners. The management community is urged to think creatively, while being cognizant
126 of the lessons of the past.

Value
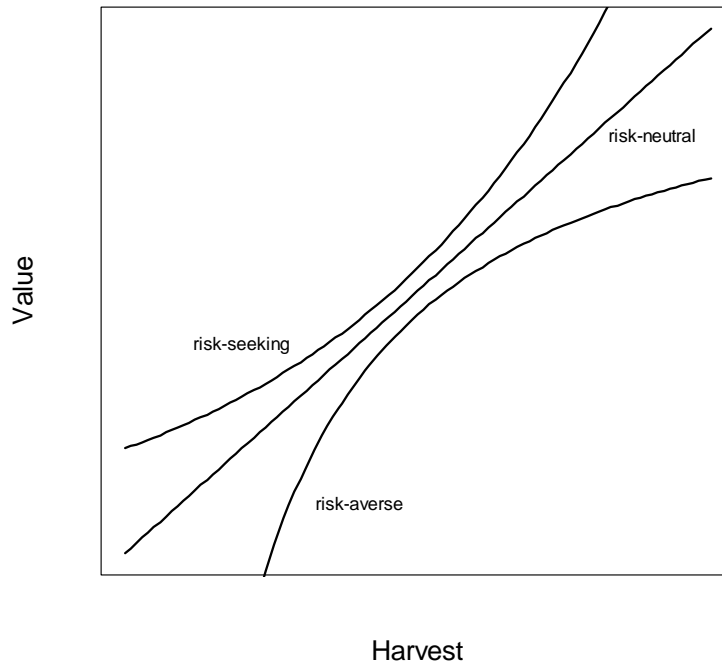
Harvest

127
128   ***Fig. 3.*** *Example of a manger's attitude toward risk. A risk-averse harvest manager is willing to forego*
129   *large harvests so long as some acceptable level of harvest is maintained. On the other hand, the risk-*
130   *seeking manager is more accepting of low harvests as long as there is a chance of the occasional high*
131   *harvest.*