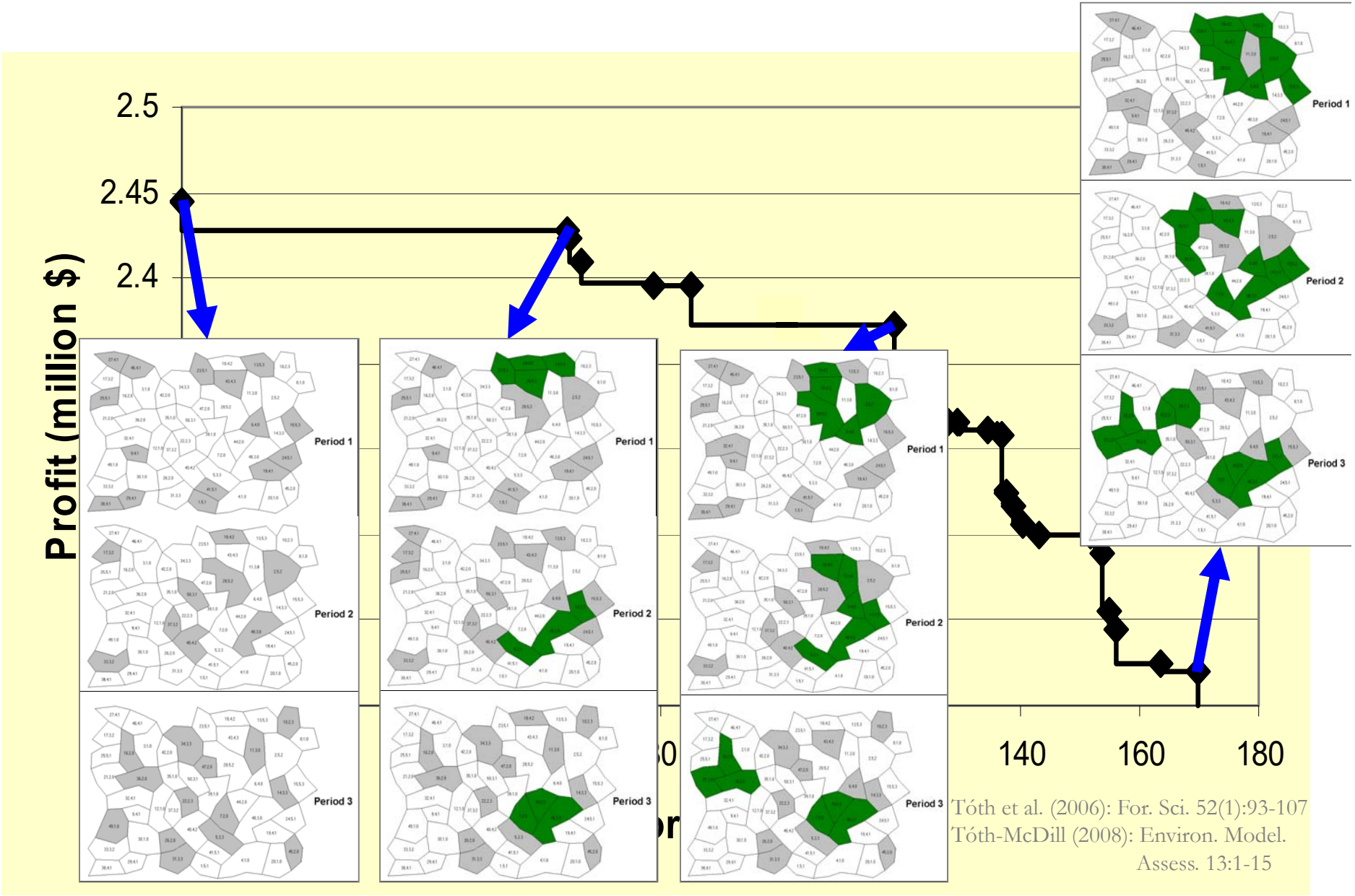
Multiple-criteria Optimization

Lecture 11 (5/10/2017)

Multi-criteria Optimization

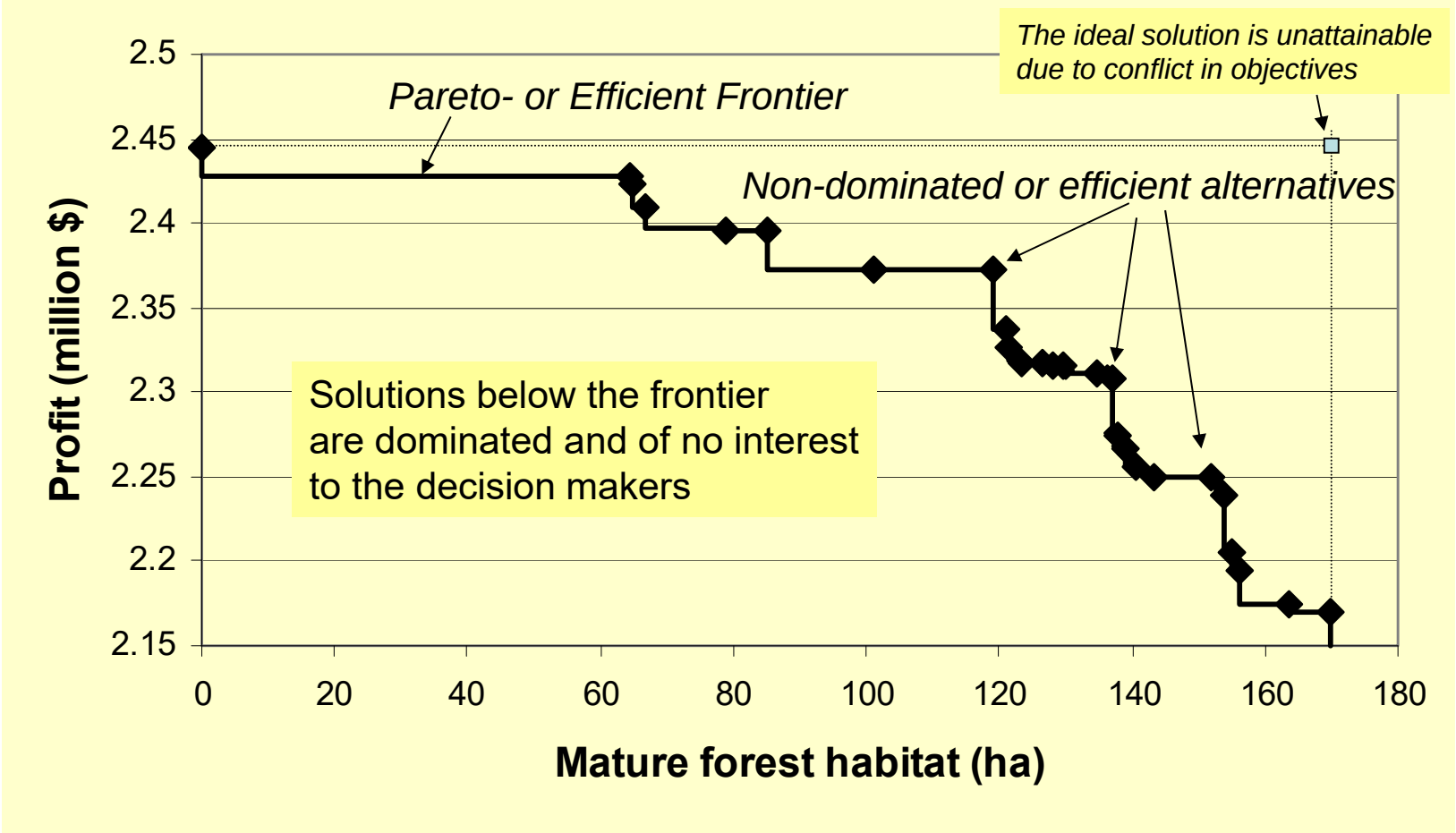
- Goal Programming (pre-emptive, non-pre-emptive)
- Pareto-set generating methods

Timber and Non-Timber Tradeoffs



Tóth et al. (2006): For. Sci. 52(1):93-107
Tóth-McDill (2008): Environ. Model. Assess. 13:1-15

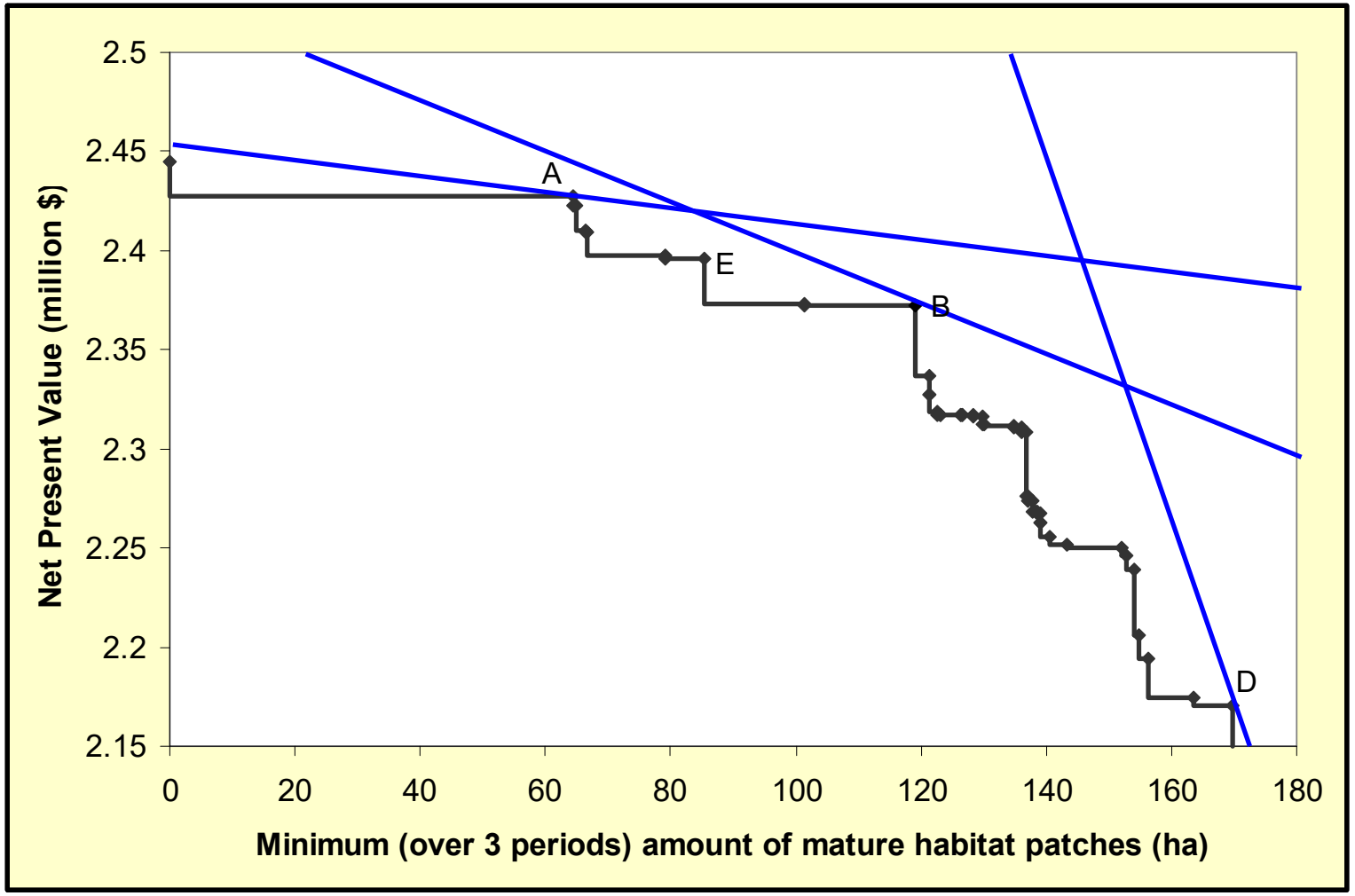
The Concept of Pareto-Optimality and Dominance



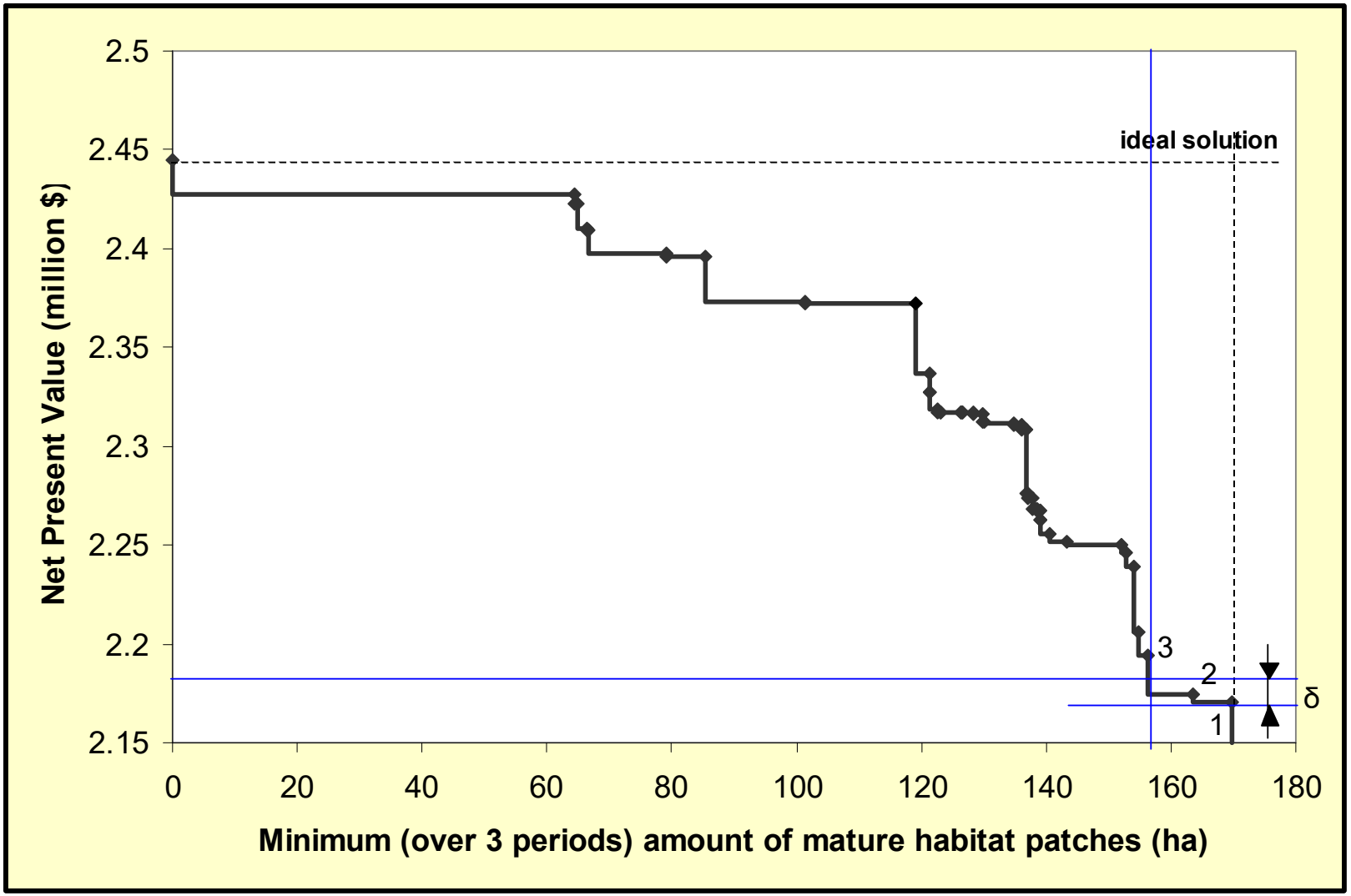
Pareto-Optimality Cont.

- A management alternative is efficient or Pareto-optimal with respect to a set of competing management objectives if no improvement is possible in achieving any of the objectives without compromising another one (the concept is due to Pareto 1908)

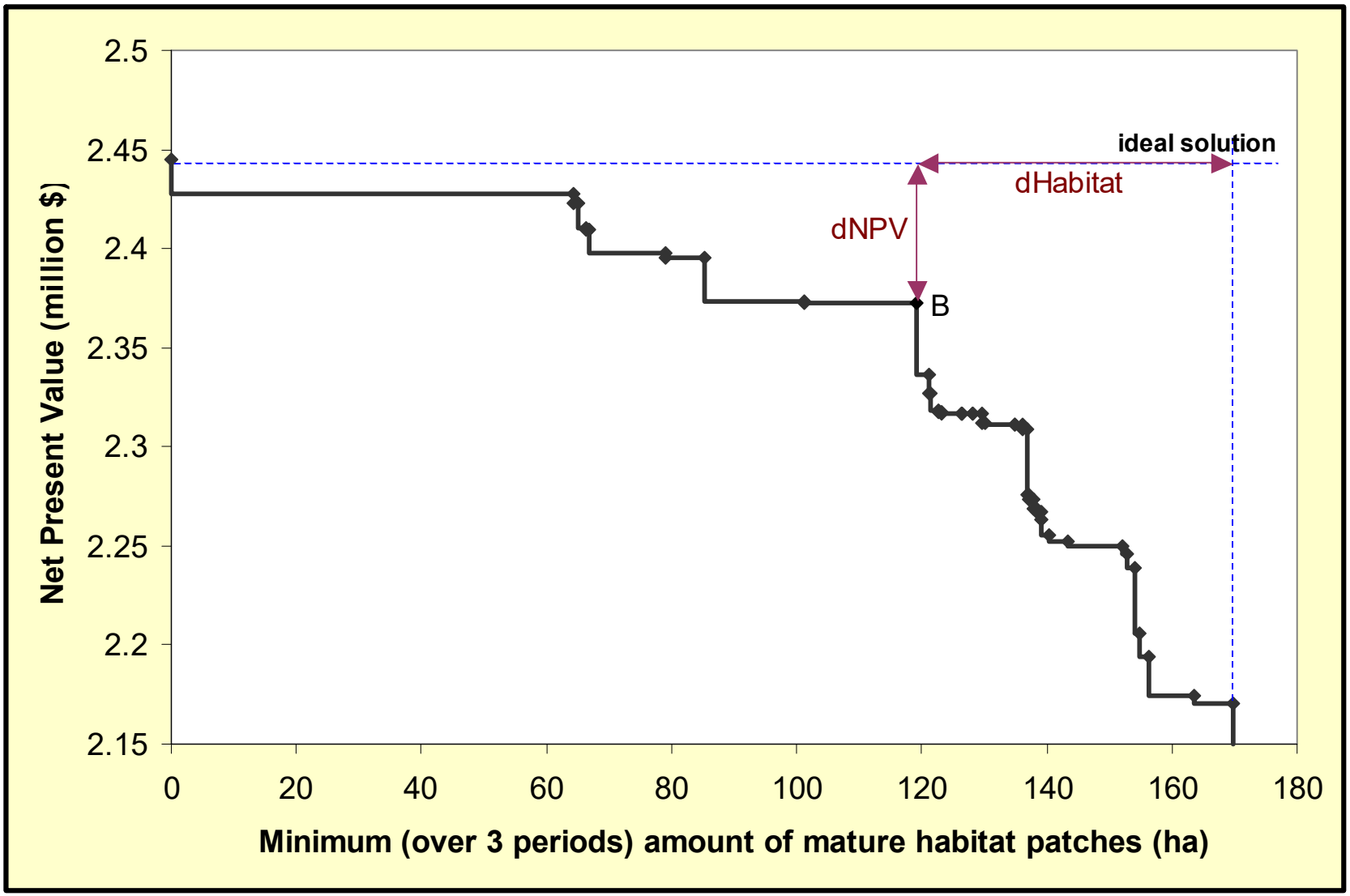
The Weighted Objective Functions Method



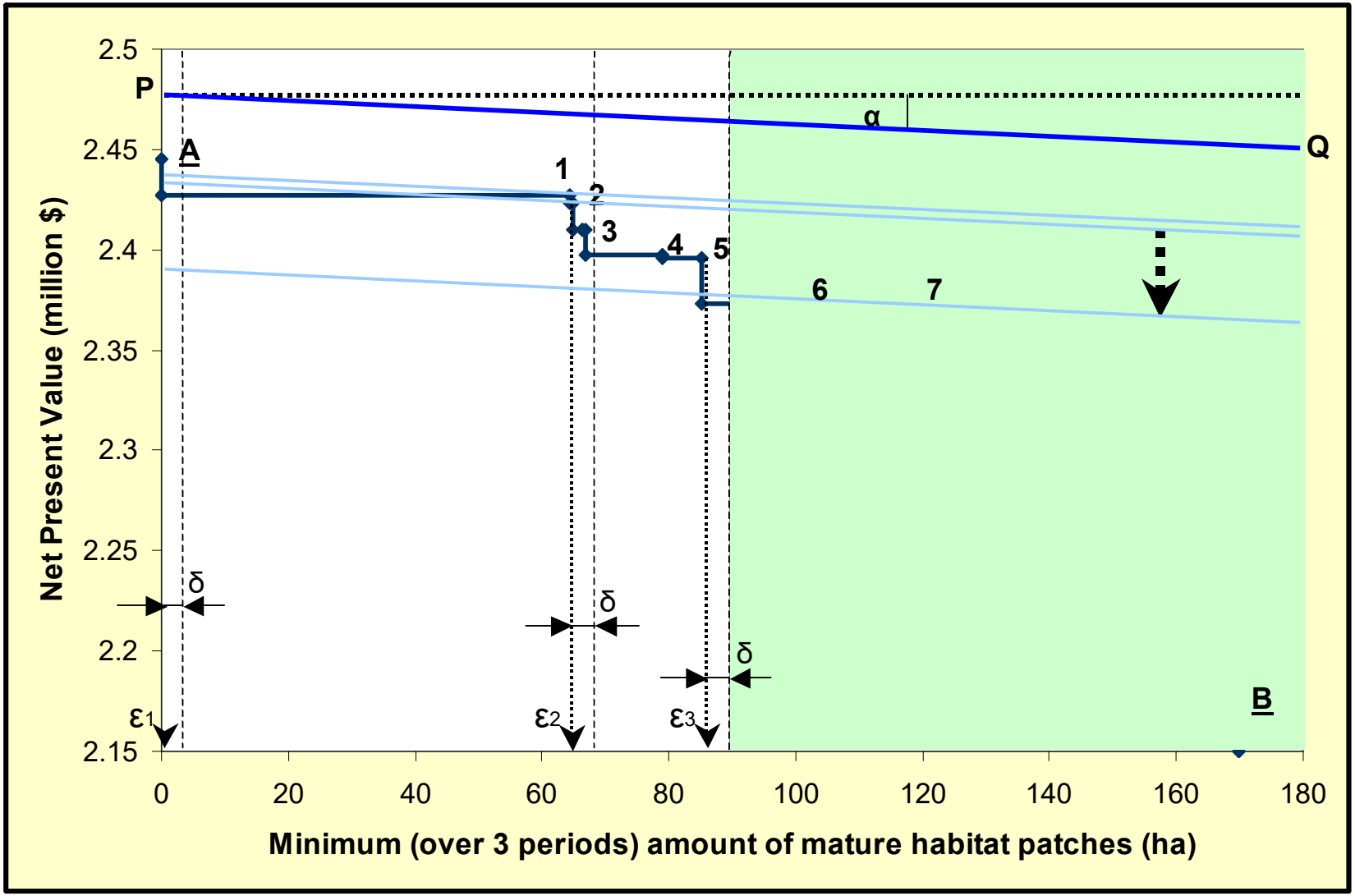
The ε- Constraining Method



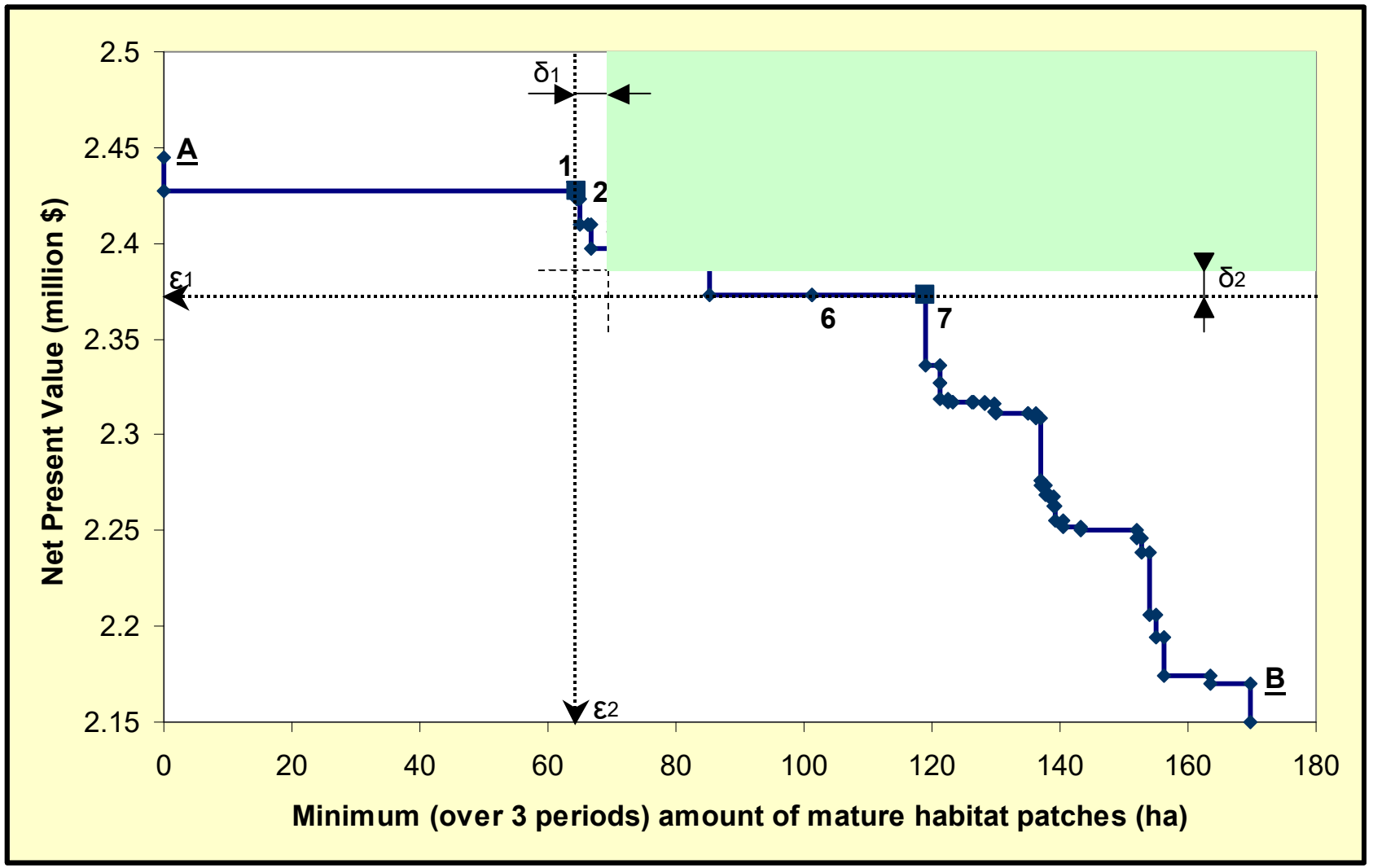
Decomposition based on the Tschebyseff Metric



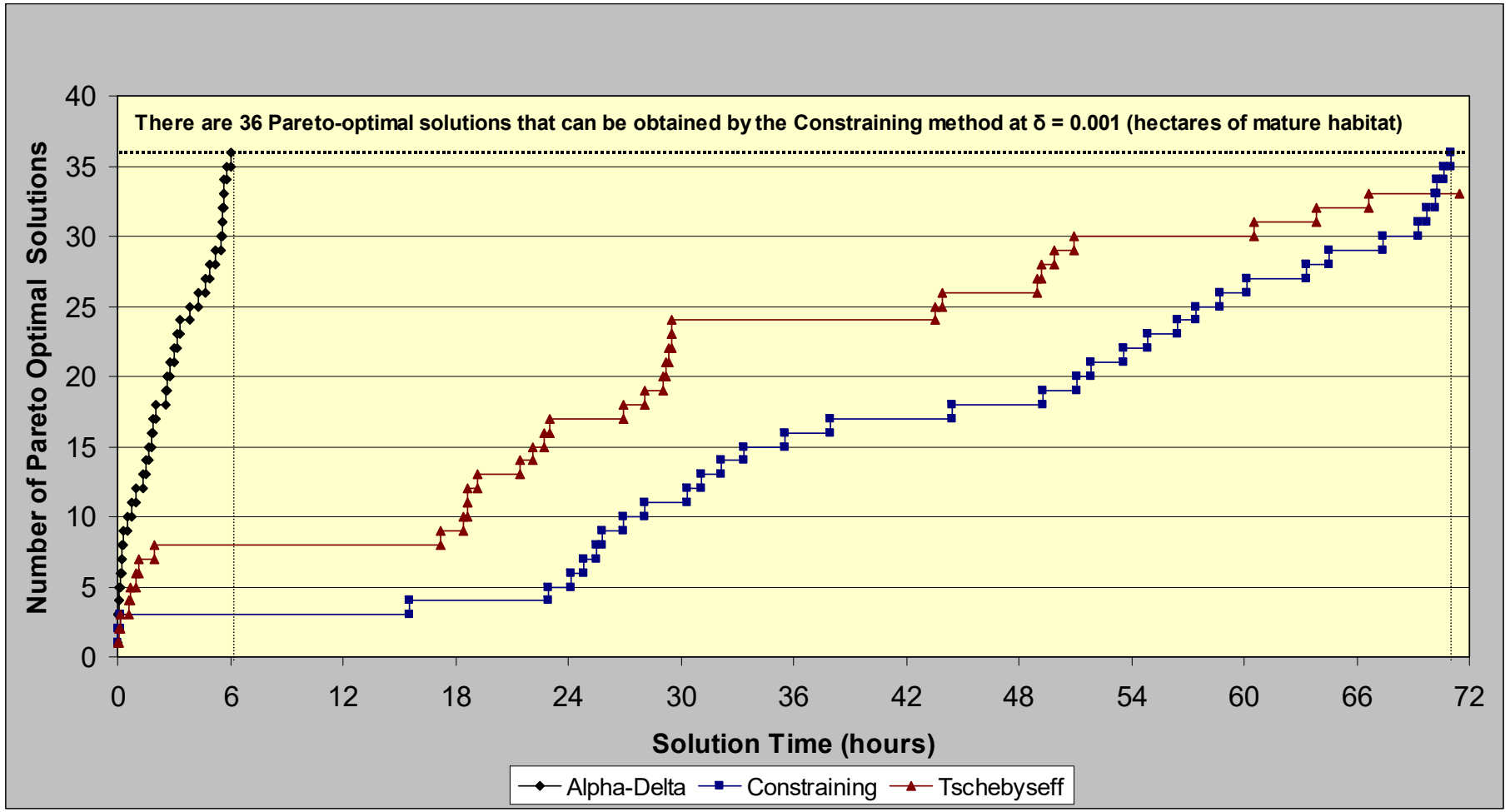
The Alpha-Delta Method



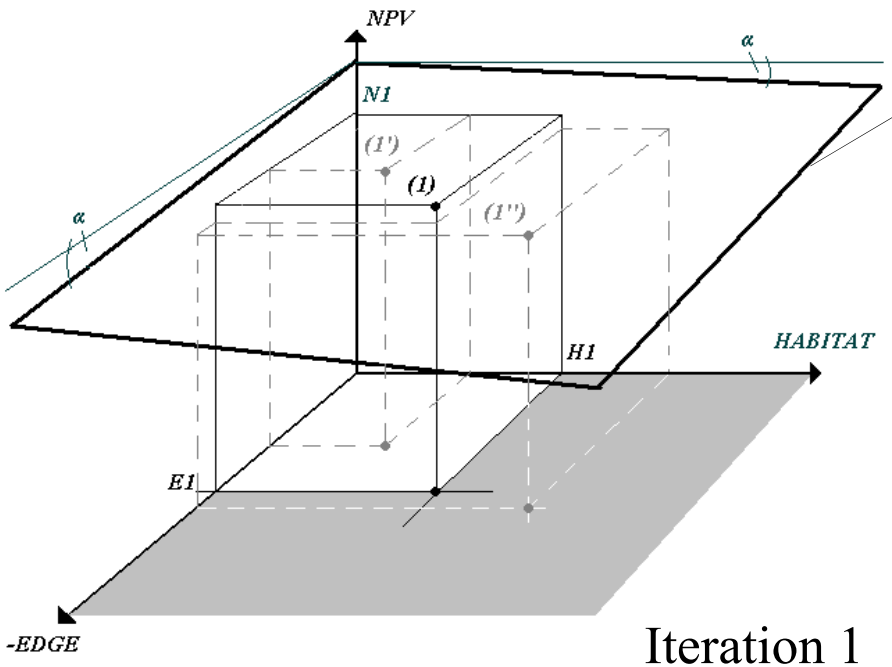
The Triangles Method



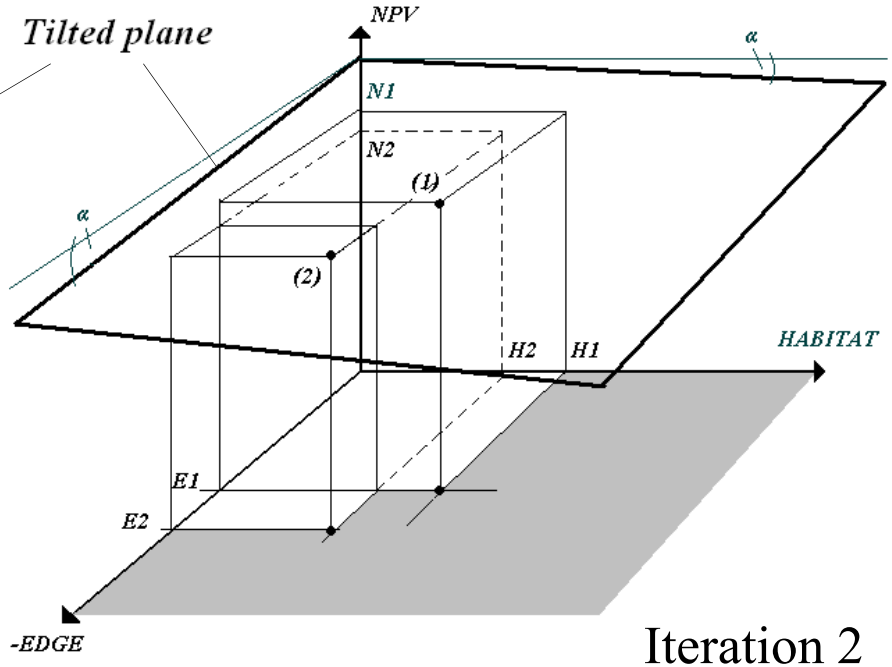
Solution Times



The Alpha-Delta Method with 3 objectives



Iteration 1

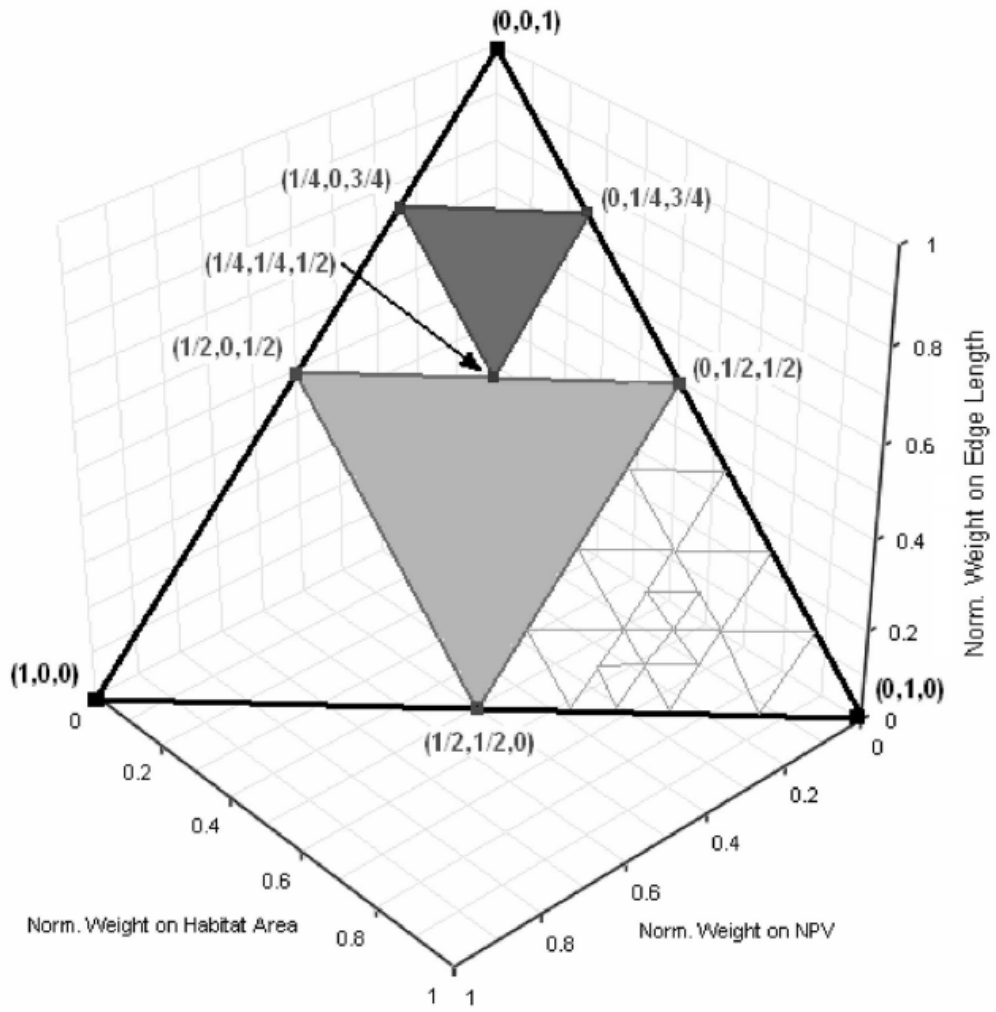


Iteration 2

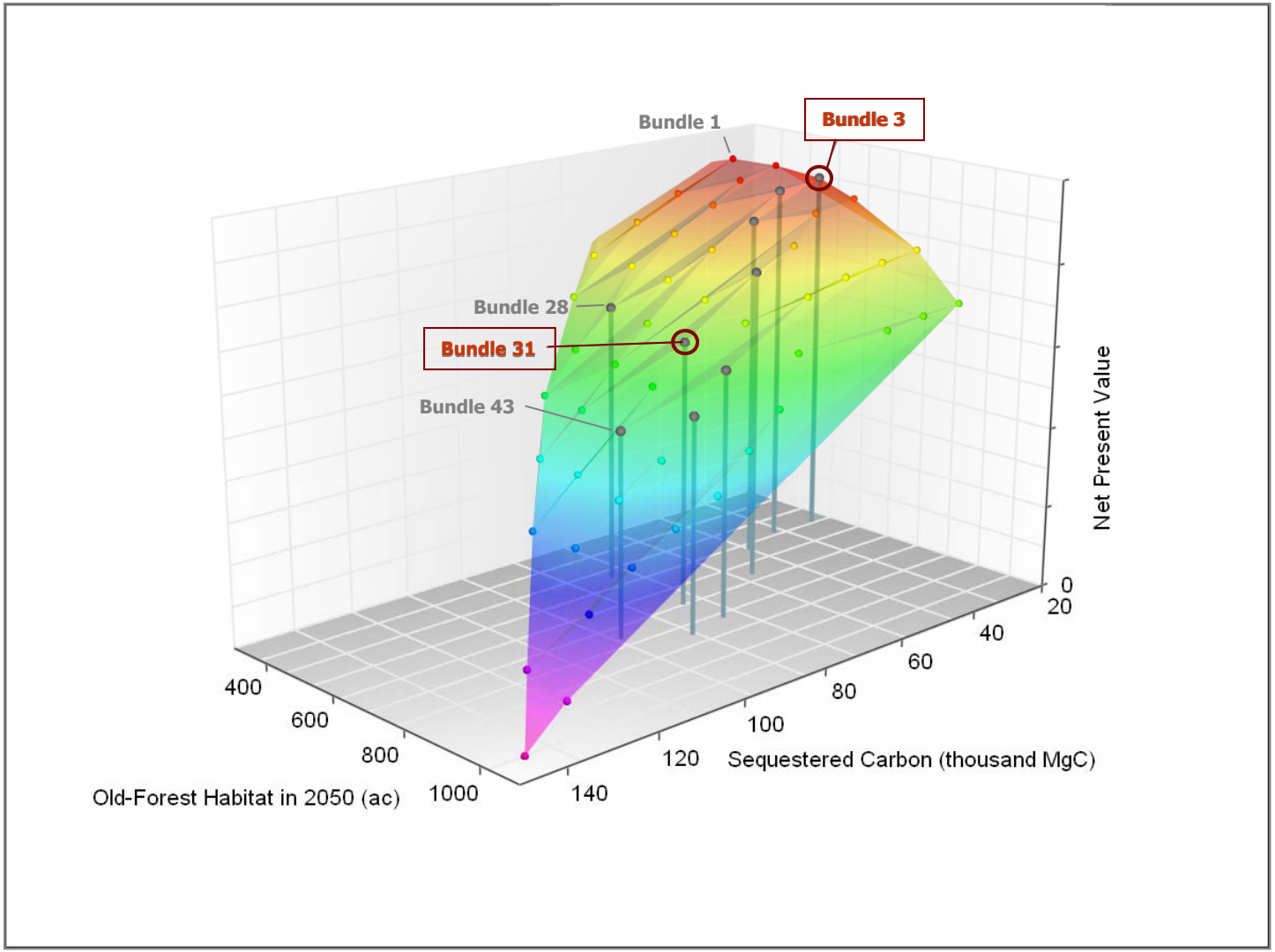
$$HABITAT \geq (H_1 + \delta)Y_1$$
$$-EDGE \geq (E_1 + \delta)Y_2$$
$$Y_1 + Y_2 = 1, \quad Y_1, Y_2 \in \{0,1\}$$

$$HABITAT \geq (H_2 + \delta)Y_3$$
$$-EDGE \geq (E_2 + \delta)Y_4$$
$$Y_3 + Y_4 = 1, \quad Y_3, Y_4 \in \{0,1\}$$

The Weighted-Method in 3D



Example#1: Pack Forest



Example#2: Tauranga-Taupo Catchment in New Zealand