Precision Riparian Buffers

Ko'olaupoko moku

2008 Hawaii Stream/Riparian Workshop

Todd Cullison

Neoma M. Lavalle

Kailua Bay Advisory Council

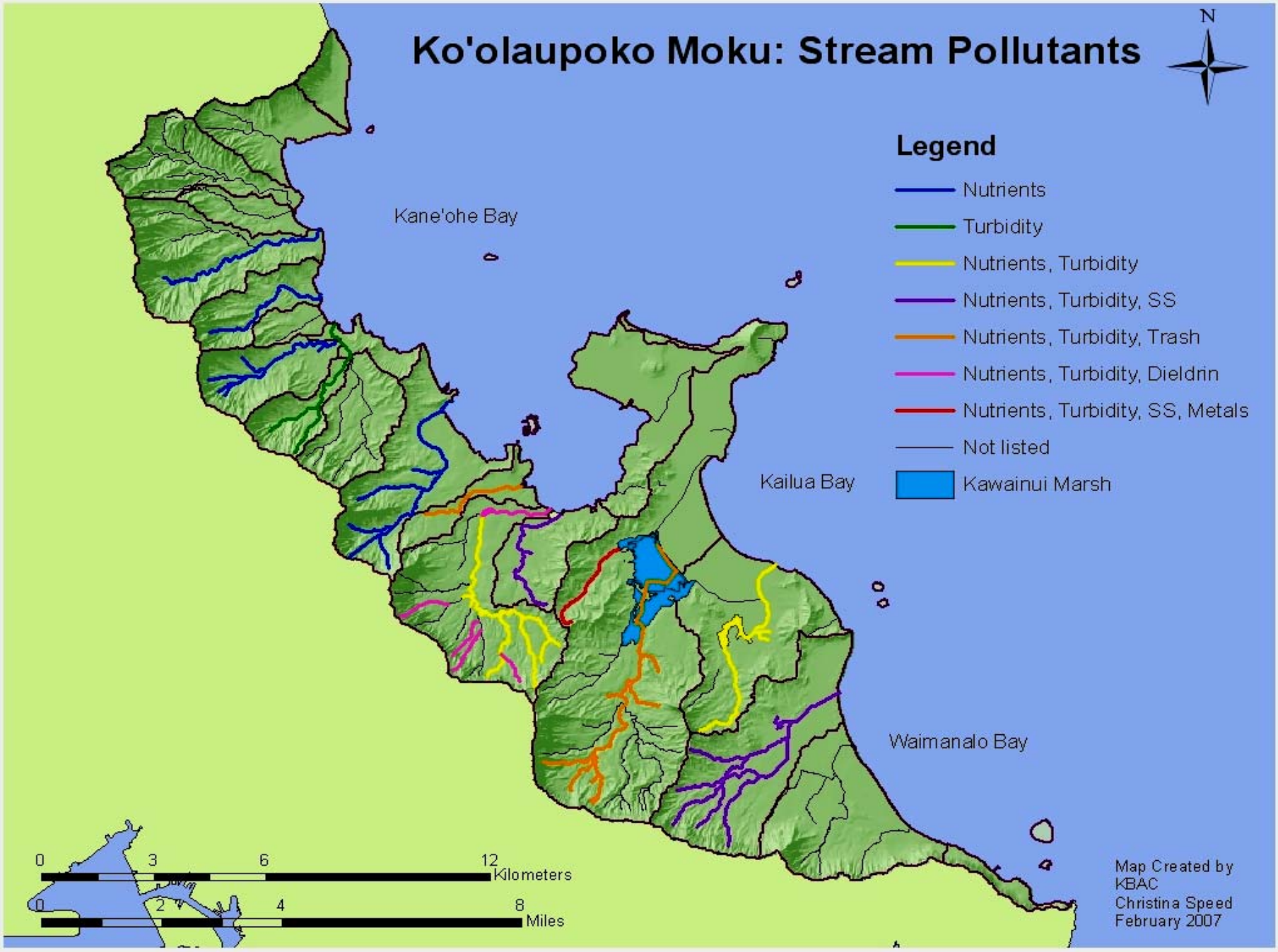
Outline

- Kailua Bay Advisory Council
- Watershed Plan & Precision Riparian Buffers
- Opportunities
- Benefits/limitations
- Next steps/partnerships

Waimanalo Stream below Kalaniana'ole Hwy.

Kailua Bay Advisory Council

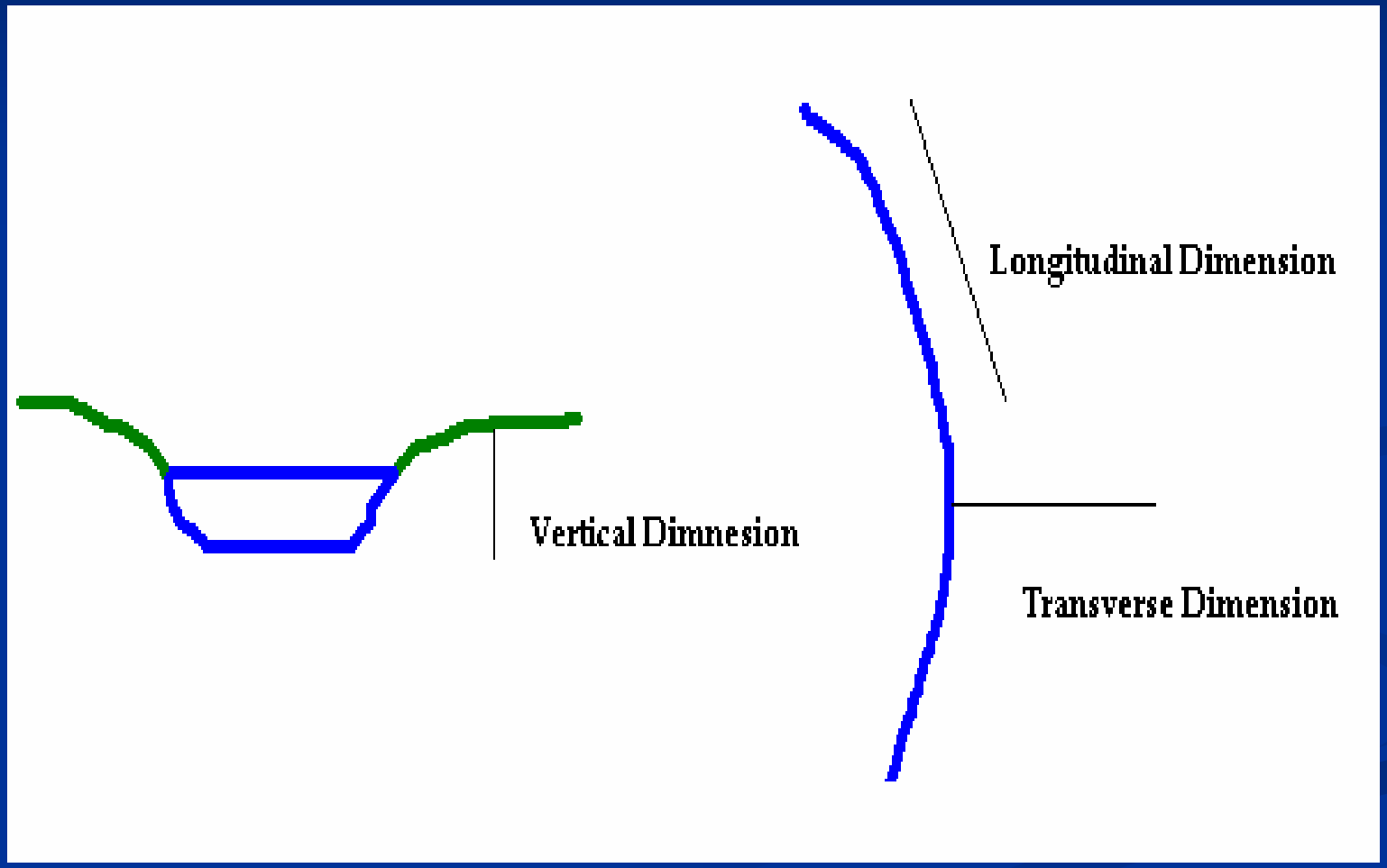
- Formed in 1995 as a result of lawsuit
- Resulting Consent Decree outlined three program areas:
  - Implementation Program
  - Technical Program (research)
  - Volunteer Water Quality Monitoring Program
- 2009 501 (c) 3 Hui o Koolaupoko


Ko'olaupoko Moku: Stream Pollutants
N
Legend
Nutrients
Turbidity
Nutrients, Turbidity
Nutrients, Turbidity, SS
Nutrients, Turbidity, Trash
Nutrients, Turbidity, Dieldrin
Nutrients, Turbidity, SS, Metals
Not listed
Kawainui Marsh
Kane'ohe Bay
Kailua Bay
Waimanalo Bay
0 3 6 12 Kilometers
0 2 4 8 Miles
Map Created by
KBAC
Christina Speed
February 2007

Watershed Restoration Action Strategy

- EPA based plan, focused primarily on NPS
- KBAC investigated all 20 sub-basins in the Ko'olaupoko moku: Makapu'u – Kualoa, EPA Priority Watershed
- Restoration/BMP recommendations based on TMDLs, other research & GIS landscape analyses
- Precision Riparian Buffers

Precision Riparian Buffers

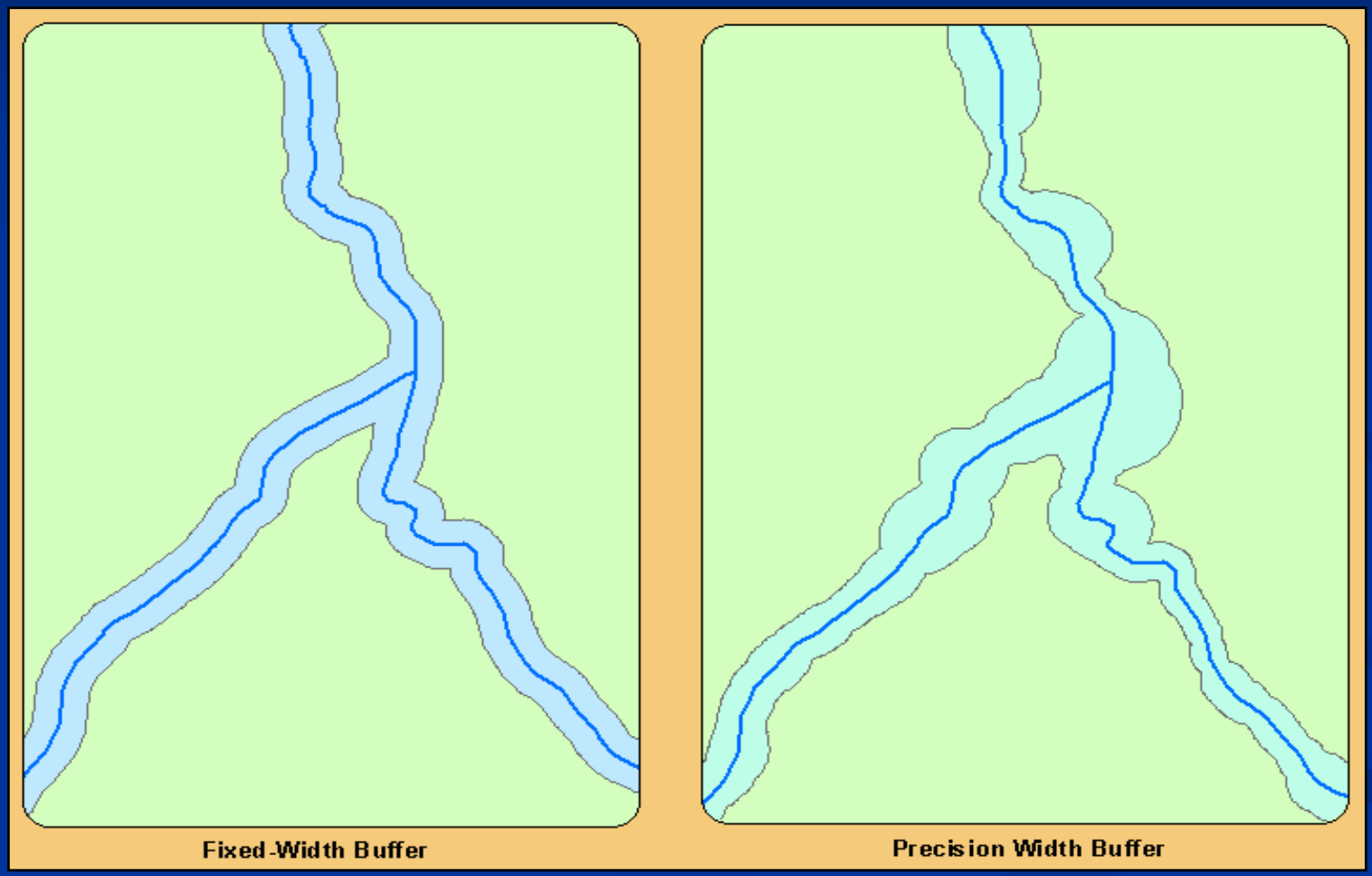


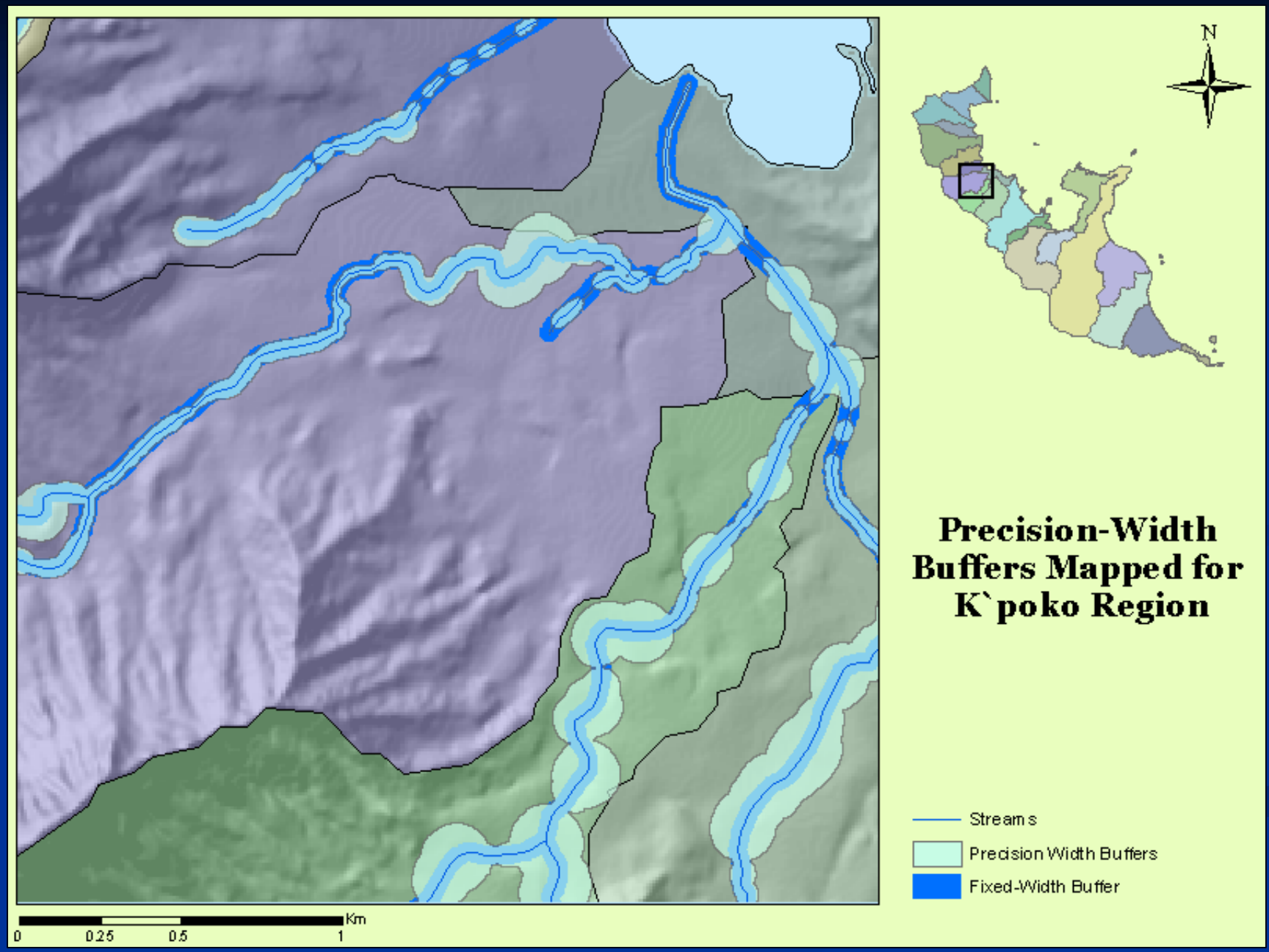
Polyakov et al., 2005

Fix Width vs. Precision

- 1). In the fixed width approach, a minimum width is defined according to regional conditions and government agencies recommendations. This is an easily implemented approach and requires minimal planning. However, it is either based on empirical relationships between buffer width and desired percent of pollutant reduction or based on a purely arbitrary decision (Polyakov, et al., 2005).
- 2). A precision or variable riparian buffer is a spatially variable riparian buffer (see Figure 3). It is designed to achieve specific water conservation goals of reduction of non-point source pollutants.

Fix Width vs. Precision




N
Precision-Width Buffers Mapped for K`poko Region
Streams
Precision Width Buffers
Fixed-Width Buffer
Km
0
0.25
0.5
1

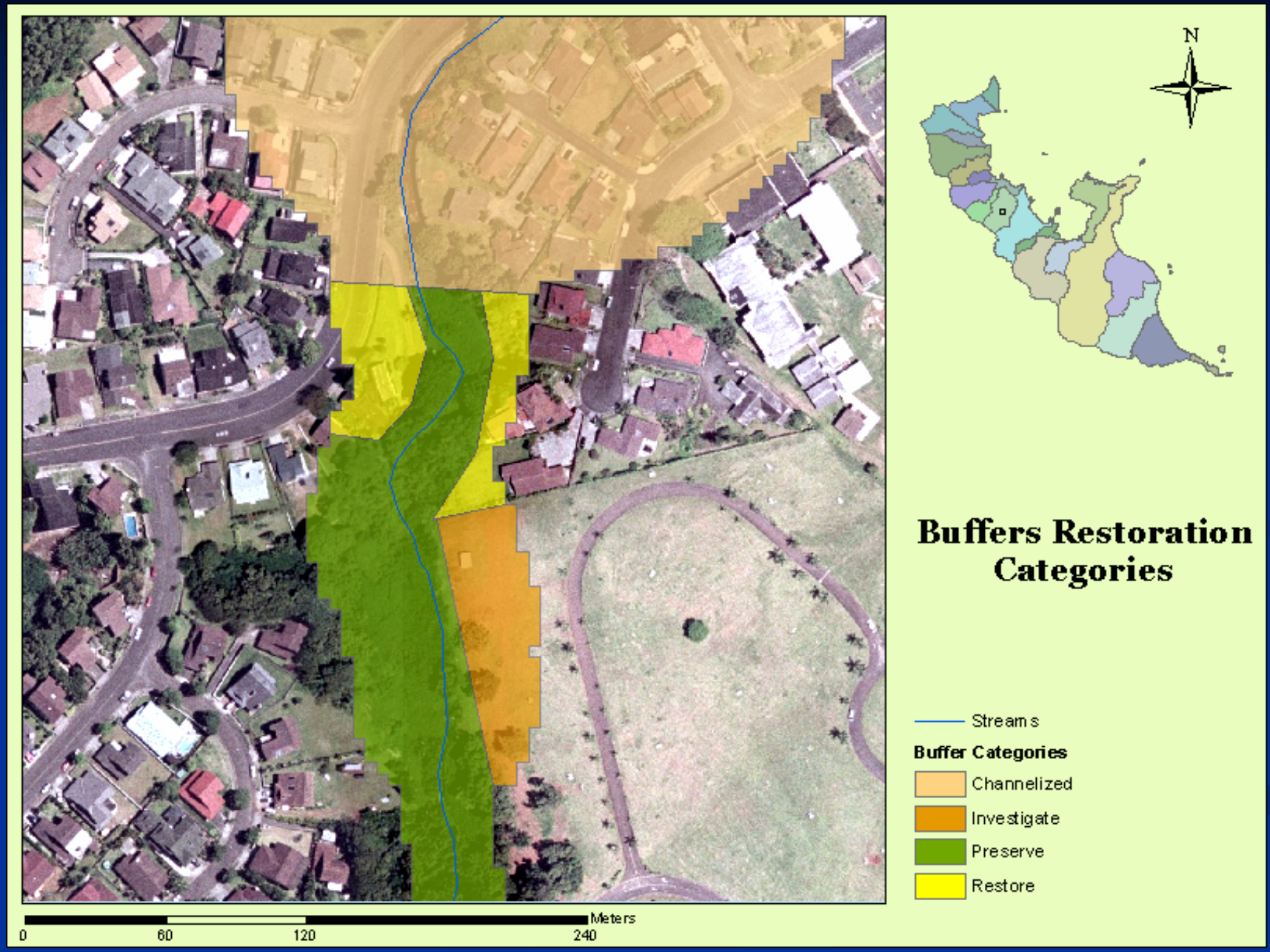
$$\frac{B_b}{B_r} = \left(\frac{n_b}{n_r}\right)^{0.5} \left(\frac{L_b}{L_r}\right)^{-2} \left(\frac{K_b}{K_r}\right)^{0.4} \left(\frac{S_b}{S_r}\right)^{0.7} \left(\frac{C_b}{C_r}\right)$$

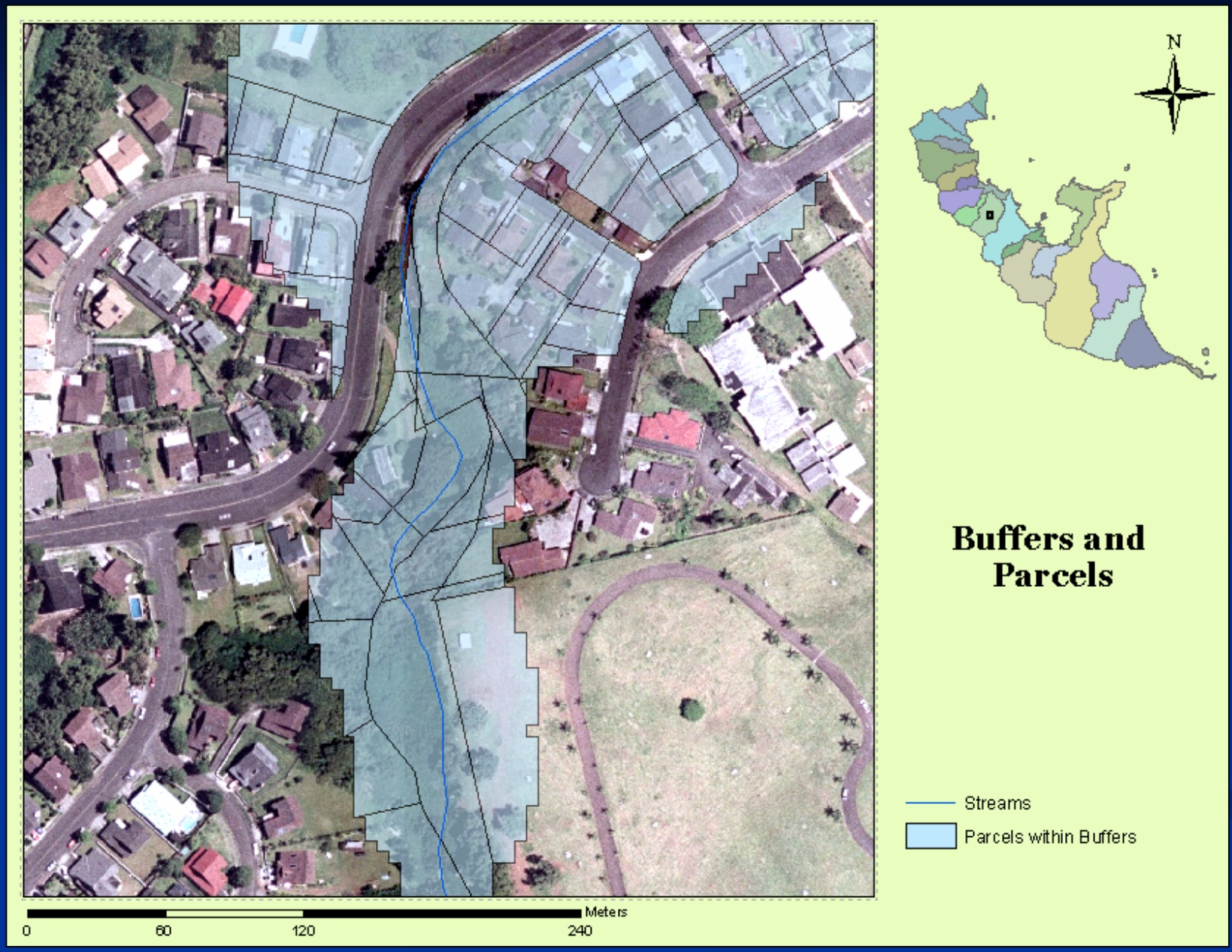
Methods for Precision Riparian Buffers in Ko'olaupoko

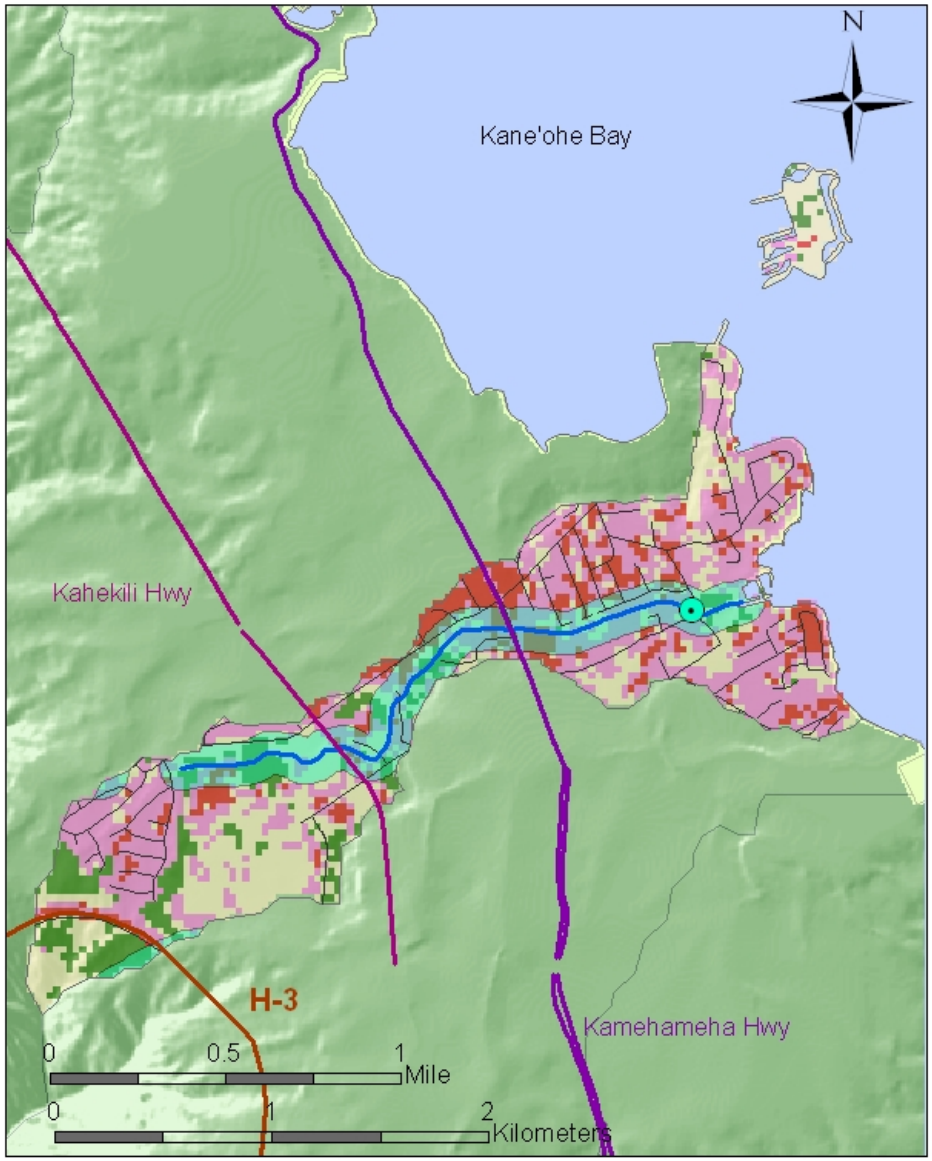
- Determine pollutants and surrounding land use
- Riparian Buffer Delineation Equation (RBDE)
- Watershed size, soil, slope, land use
- Aerial interpretation of riparian habitat & TMK
- Four categories
  - Channelized
  - Investigate
  - Restore
  - Preserve
- Landowners with greater than 1,000 acres

S = 11%
n=0.3034
K=4.6 cm/h
C=14.1 cm
Buffer Width=36m

Reference Values


N
Buffers Restoration Categories
Streams
Buffer Categories
Channelized
Investigate
Preserve
Restore
Meters
0
60
120
240


N
Buffers and Parcels
Streams
Parcels within Buffers
Meters
0
60
120
240



Kea'ahala Watershed: Land Use

Data Source: C-CAP

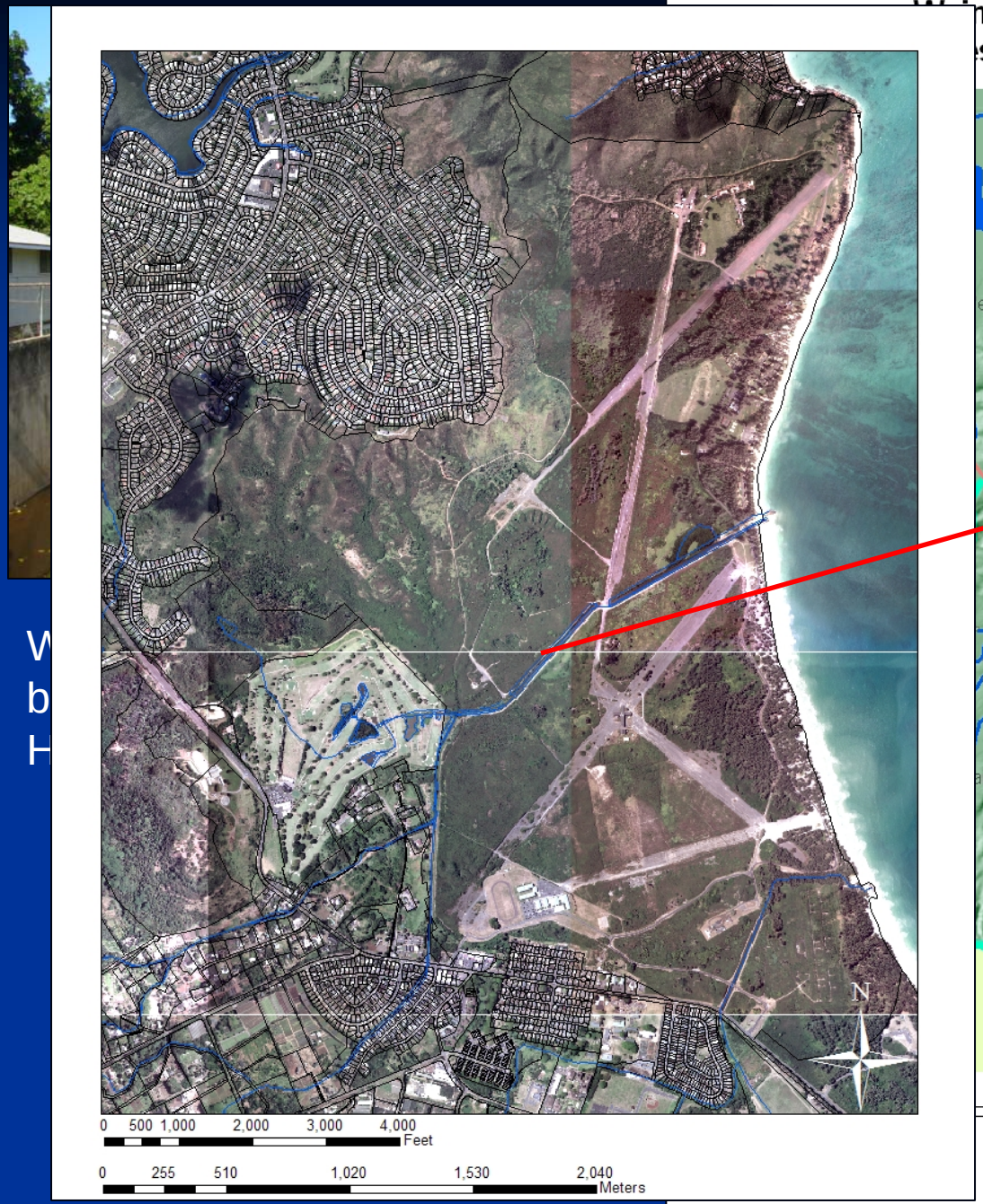
Within 100 meters of Kea'ahala Stream

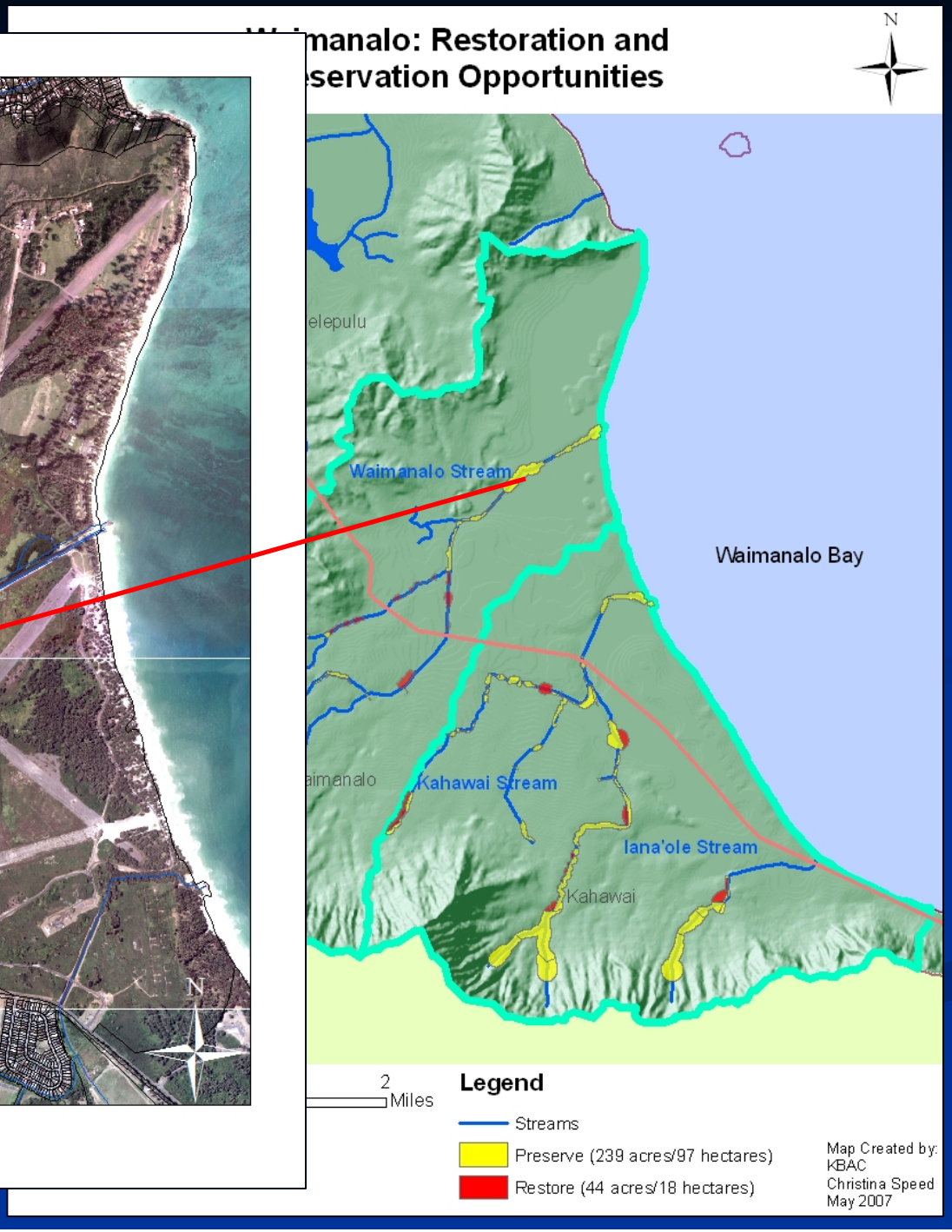
Land Use	Total Area of Land Use (HA)	Area (HA) within 100 meters	% within 100 meters
High Intensity Development	43.38	8.37	19.29%
Low Intensity Development	134.28	24.3	18.10%
Agricultural Lands	N/A	N/A	N/A
Wetlands	N/A	N/A	N/A
Forested Lands	33.03	11.25	34.06%
Other	100.44	22.23	22.13%

Legend

- Water Quality Monitoring Stations (DOH)
- Kea'ahala Stream
- Streets
- 100 m Buffer
- High Intensity Development
- Low Intensity Development
- Forest
- Other

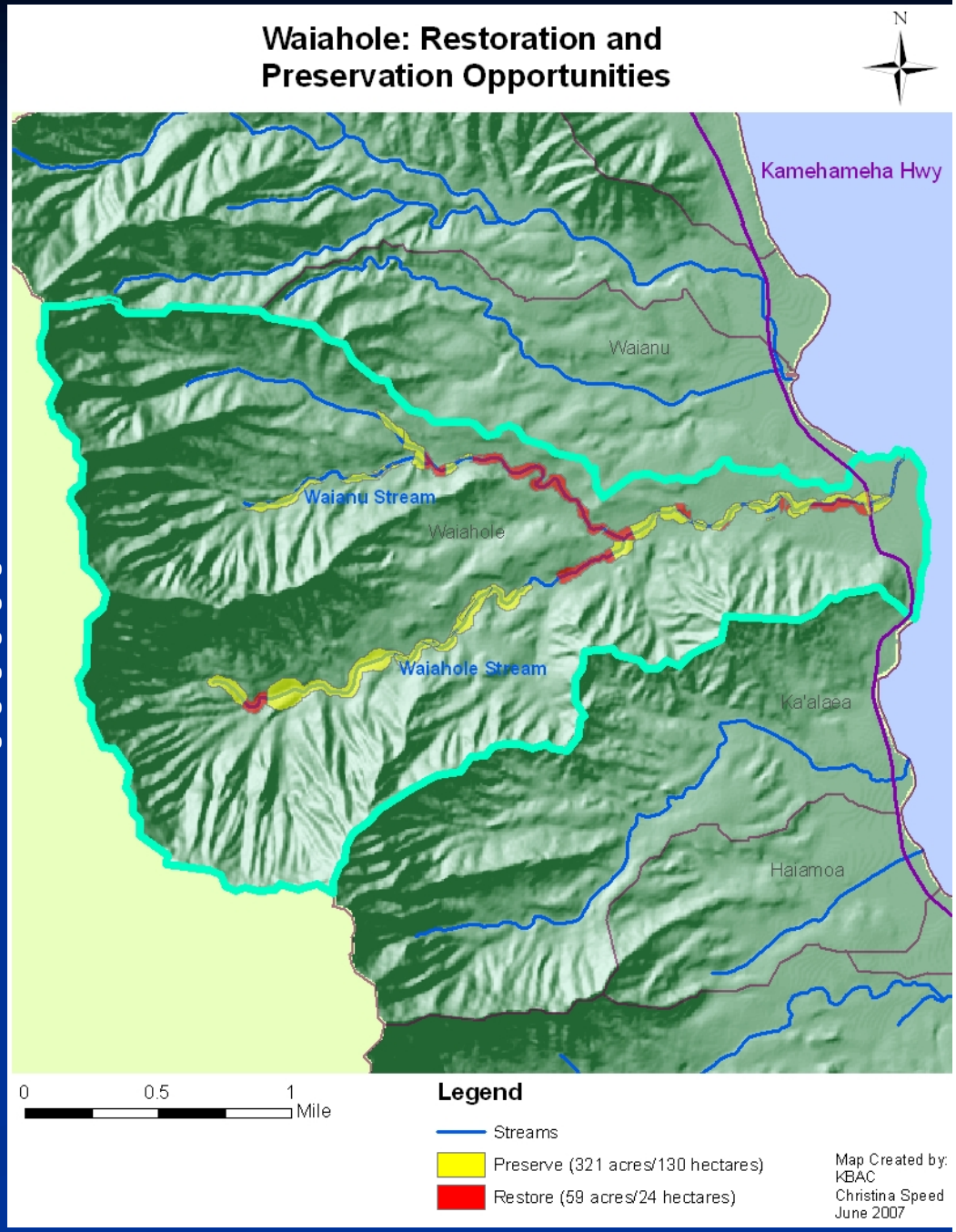
Map Created by:
KBAC
Christina Speed
September 2006


0 500 1,000 2,000 3,000 4,000
Feet
0 255 510 1,020 1,530 2,040
Meters
N


manalo: Restoration and
servation Opportunities
N
elepulu
Waimanalo Stream
Waimanalo Bay
aimanalo
Kahawai Stream
Iana'ole Stream
Kahawai
2
Miles
Legend
Streams
Preserve (239 acres/97 hectares)
Restore (44 acres/18 hectares)
Map Created by:
KBAC
Christina Speed
May 2007

Waiahole listed for nitrite/nitrates

Waiahole	Hectares	%/land use
High Intensity Development	0.36	0%
Low Intensity Development	6.66	1%
Agricultural Lands	75.33	7%
Wetlands	2.61	0%
Forested Lands	477.09	47%
Other	460.53	45%



Benefits/limitations

- A well-functioning vegetated riparian buffer can remove up to 70% of nitrates found in a stream, a common pollutant in the Ko'olaupoko Moku (Polyakov, et al., 2005)
- Identified other opportunities for habitat improvements
- Opportunities for large-scale restoration may be in wrong areas. For example, are forested uplands significant sources of erosion, nutrients, and other pollutants?

Next Steps

- Create opportunities and partnerships with agencies, landowners and community
- Provide data to others, allow additional conclusions to be drawn
- Higher resolution baseline monitoring of priority watershed(s)

Contact

- Todd Cullison
- tcullison@hawaii.rr.com
- 277-5611 p
- 262-6242 f