Evaluating Beaver Activity and Dam Analog Structures in the LCRE

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Background & purpose

- Active restoration in Lower Columbia River Estuary
- Emerging recognition of beaver benefits
- Beaver analog structures (BASs) in tidal areas
- How do BASs work?
- How to assess potential functionality of BASs?
- Can implementation of BASs be improved?

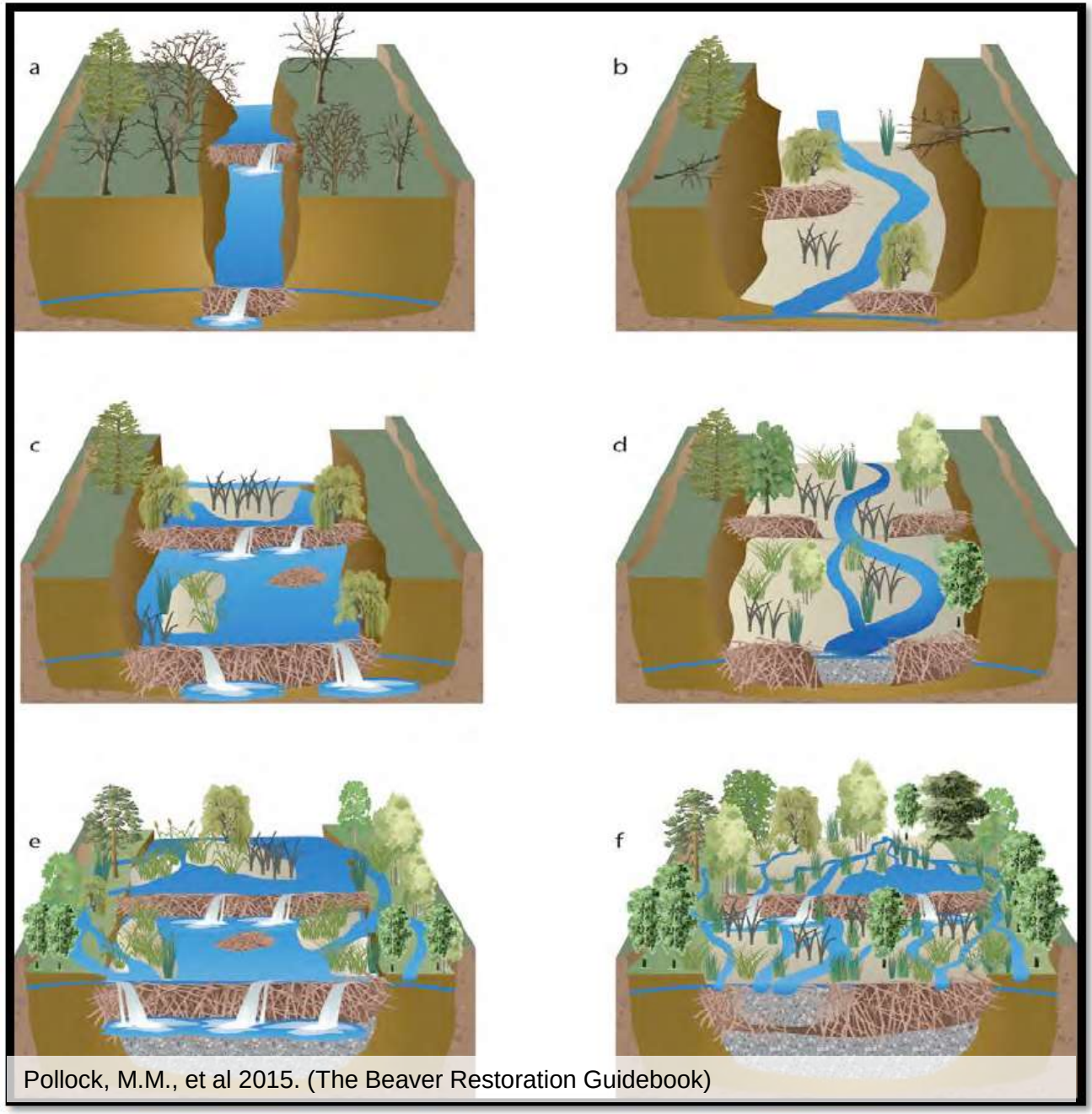
What are Beaver Analog Structures (BASs)?






Process & benefits of dams

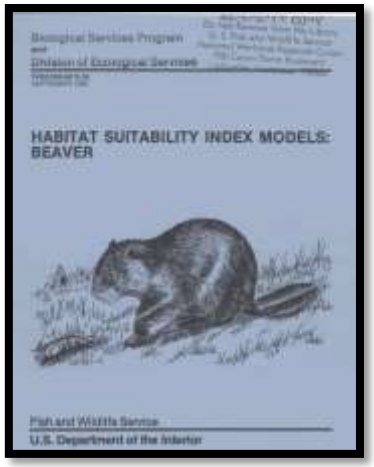
- Groundwater recharge/connectivity
- Channel widening
- Sediment accretion/ vegetation
- Increase veg rich./div.
- Lower stream power
- Raised water table
- Higher base flows, cooler flow



Pollock, M.M., et al 2015. (The Beaver Restoration Guidebook)

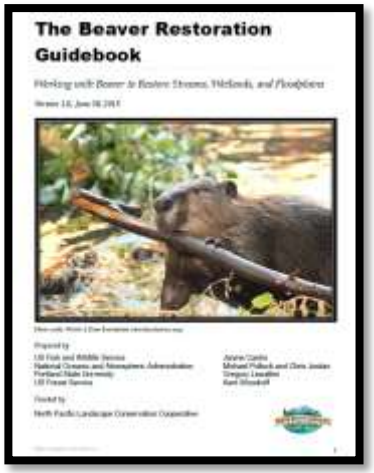
Beaver Assessments

- HSI (1982-83) for beavers – beavers are everywhere!

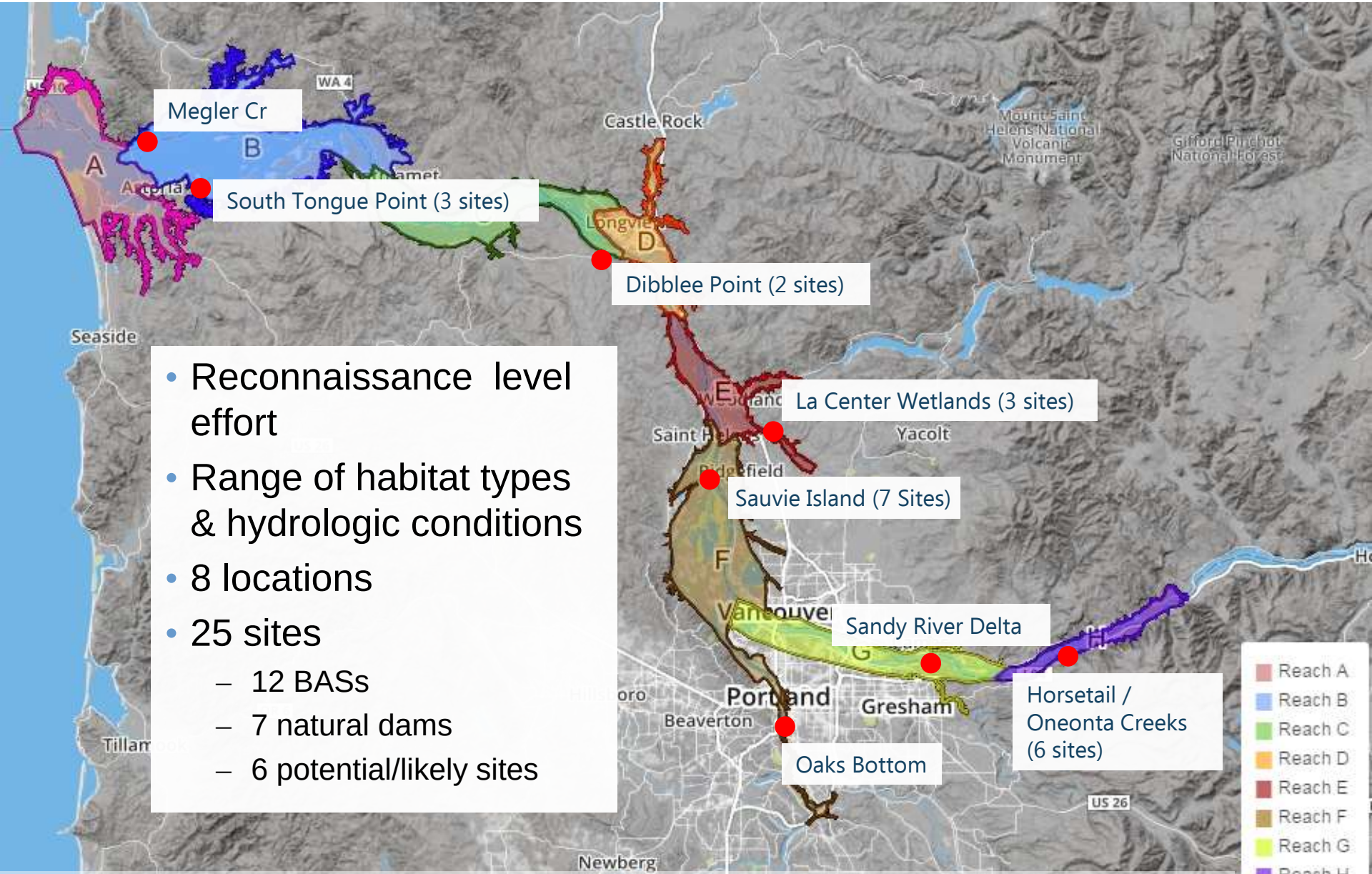


- BRAT (2014) – Utah-specific

- USFWS/NOAA/USFS/PSU Beaver Guidebook (2015) – limited tidal information



Approach



- Reconnaissance level effort
- Range of habitat types & hydrologic conditions
- 8 locations
- 25 sites
  - 12 BASs
  - 7 natural dams
  - 6 potential/likely sites

Approach

Hydrology

Morphology

Vegetation

Dam it… to build or not to build?

Data Collection

- Vegetation (general cover/density, proximity to bank)
- Hydrology (tidal/fluvial dominance, depth, velocity)
- Morphology (width, depth, side-slope, substrate)
- Beaver presence / absence, former dams
- Other potentially relevant potential factors (water control structures, burrows etc.)



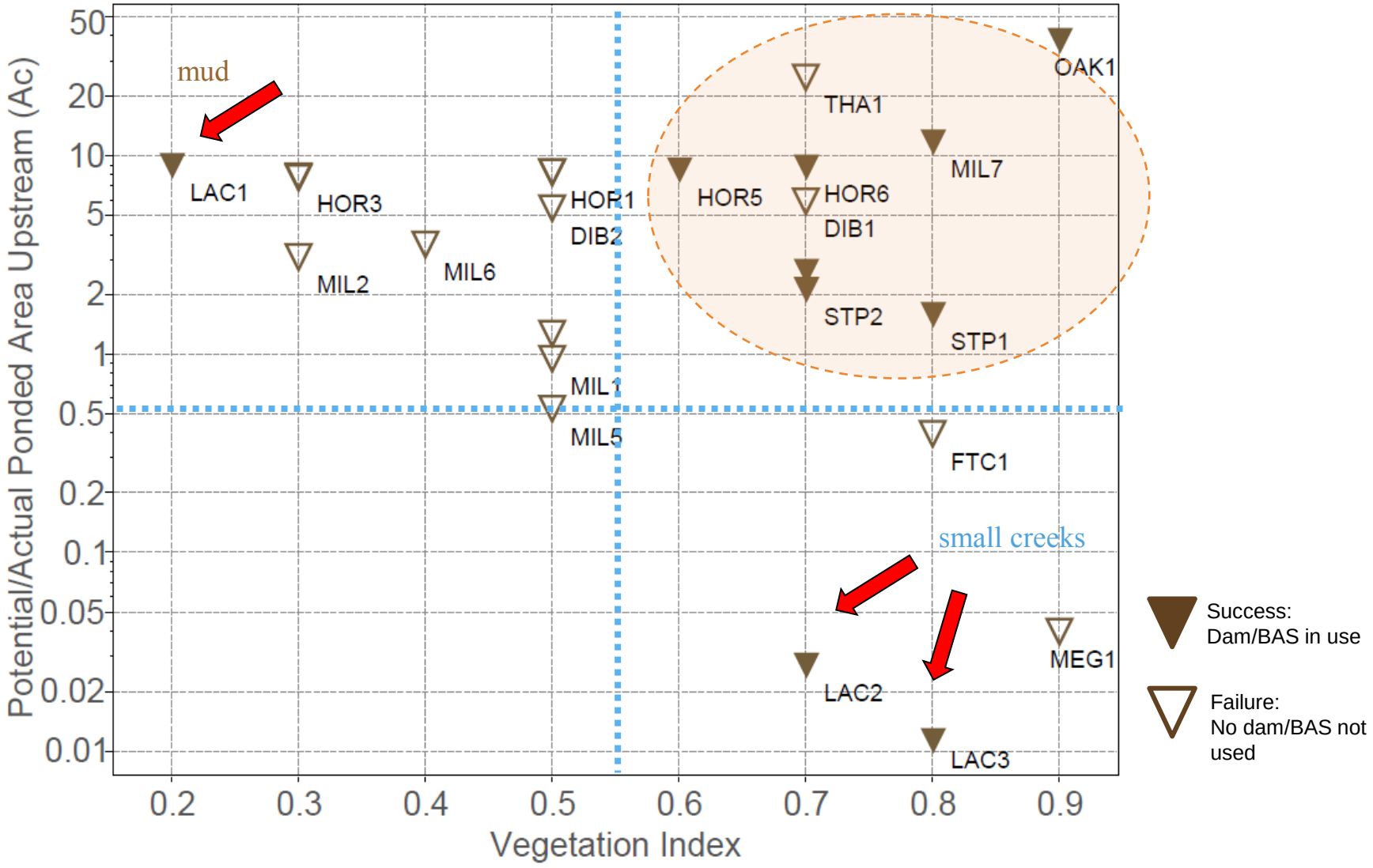

SAUVIE ISLAND – DEEP/WIDGEON SL

SOUTH TONGUE POINT

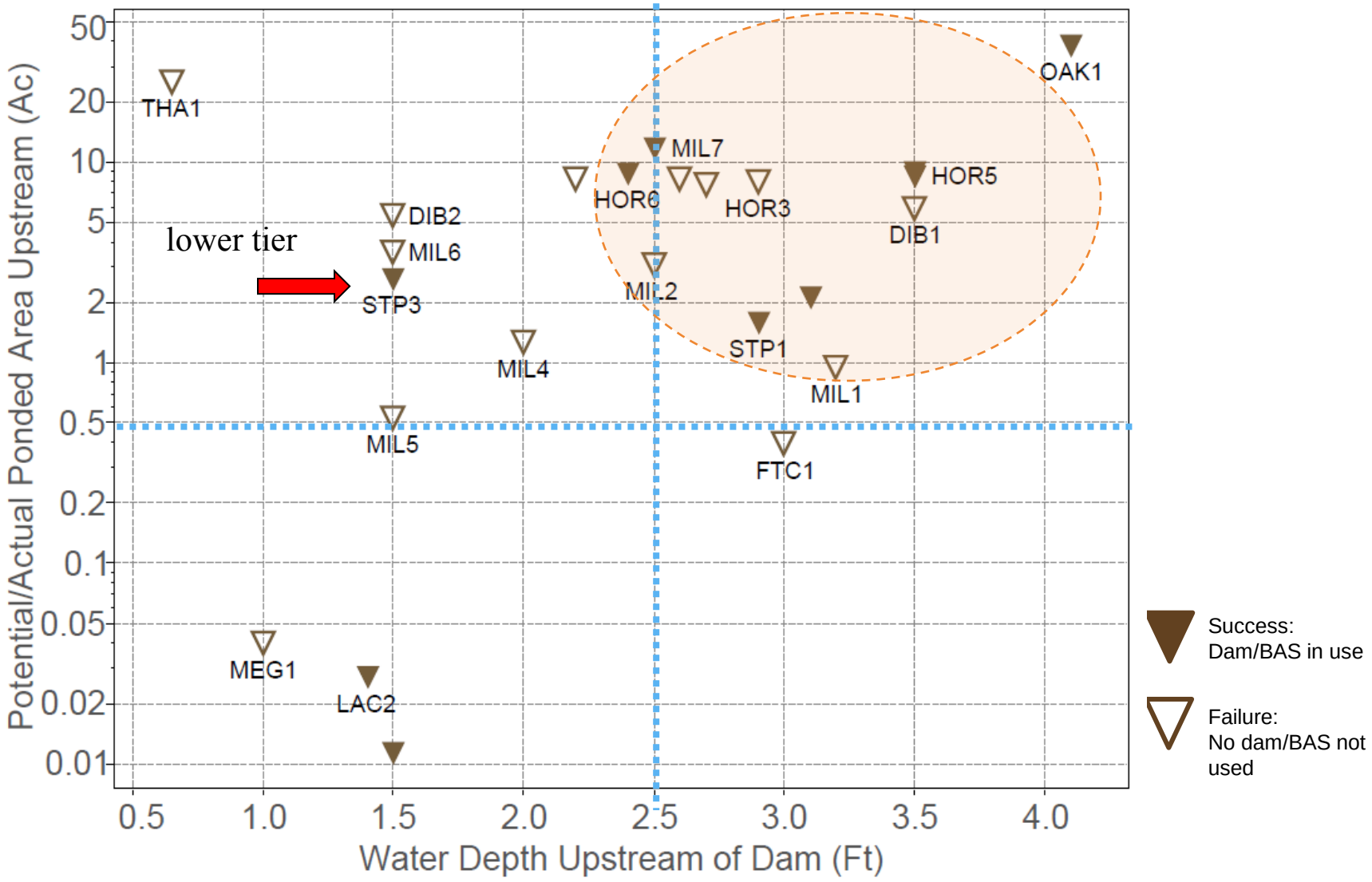
HORSETAIL CREEK

DIBBLEE POINT

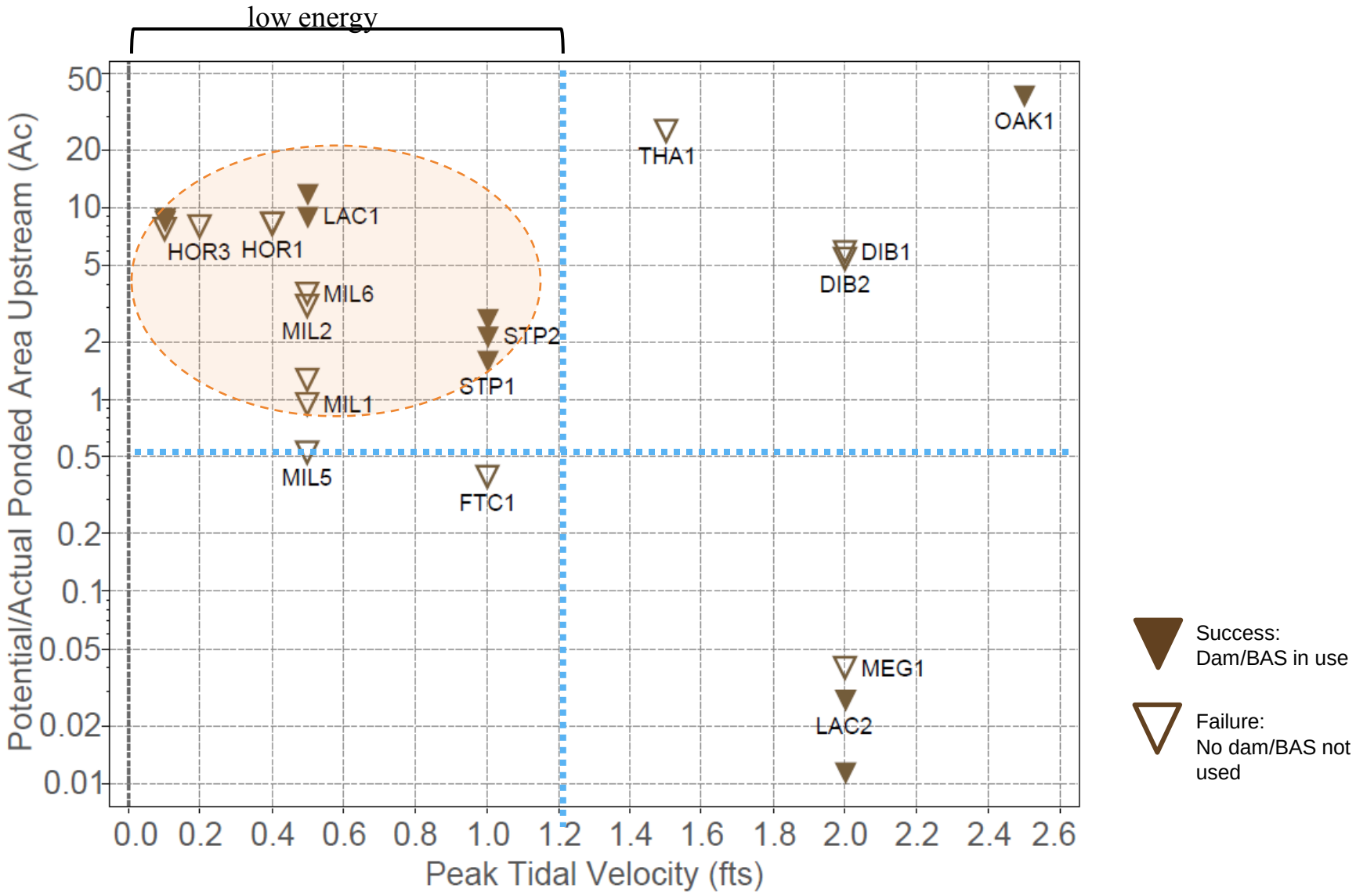
Results: Vegetation



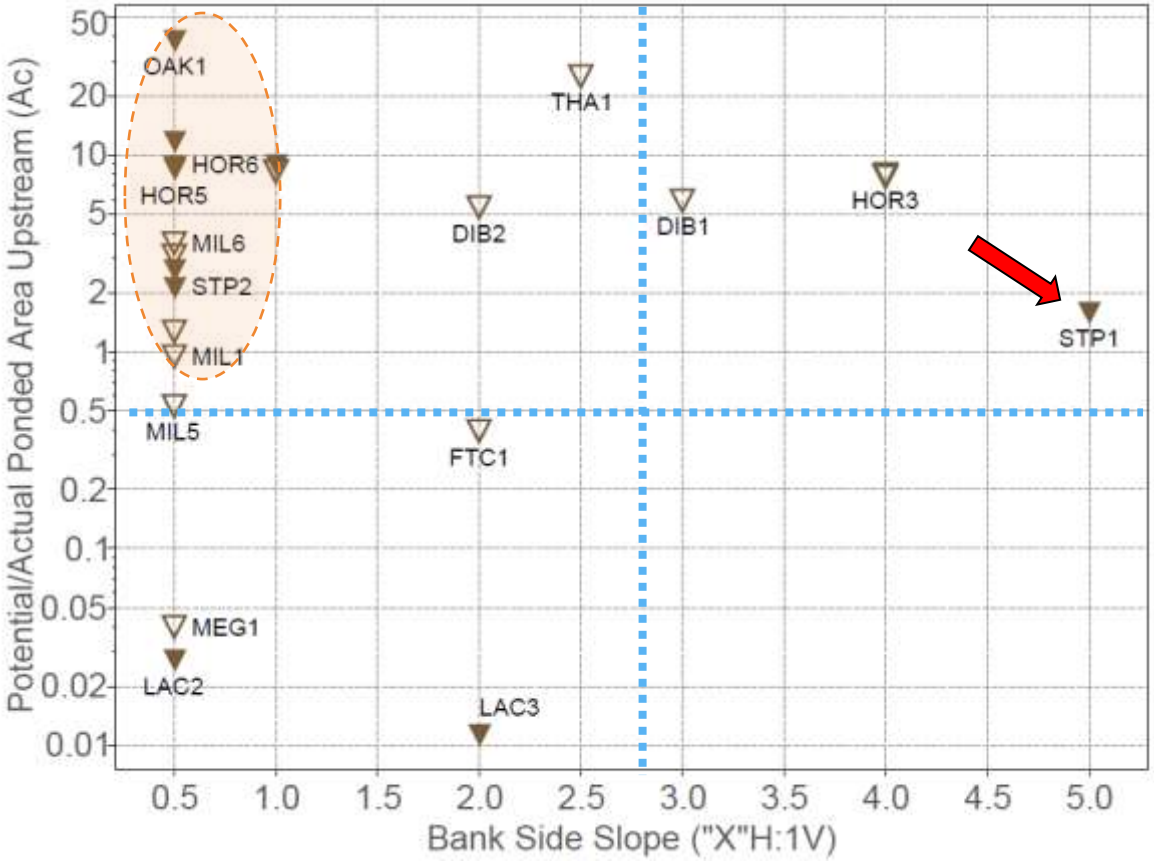
Results: Hydrology

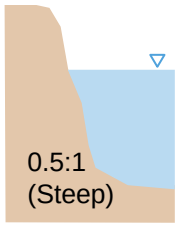


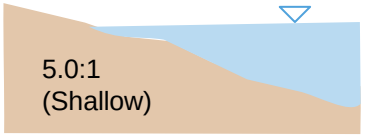
Results: Hydrology



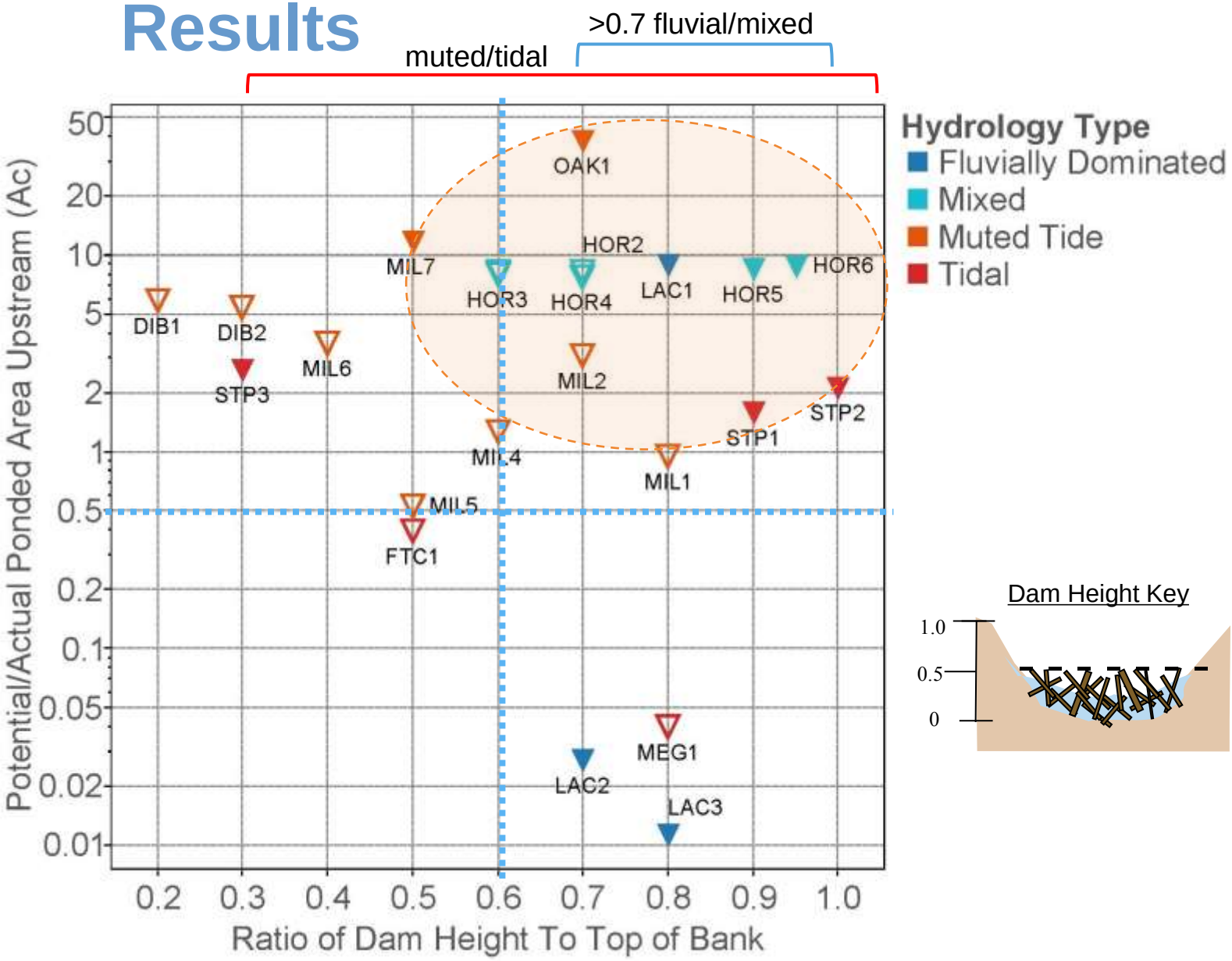
Results: Morphology







Results


muted/tidal
>0.7 fluvial/mixed
Potential/Actual Ponded Area Upstream (Ac)
50
20
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Ratio of Dam Height To Top of Bank
OAK1
MIL7
HOR2
HOR3
HOR4
LAC1
HOR5
HOR6
DIB1
DIB2
STP3
MIL6
MIL2
STP2
STP1
MIL4
MIL1
MIL5
FTC1
MEG1
LAC2
LAC3
Hydrology Type
Fluvially Dominated
Mixed
Muted Tide
Tidal
Dam Height Key
1.0
0.5
0

Findings – Very Low Overall Use

- 1 out of 12 BASs used (give up now!)
- Some structures very close; redundant (multi-use)
- New/immature, recently restored sites
- Adequate existing water depths (no dam needed)
- Lack of acoustics?

Findings and Recommendations

- Vegetation
  - Sticks - yes, but don't forget mud!
  - Key difference: fluvial systems (coarser sediment) v. tidal (silt/mud)
- Morphology
  - Low bank preference
  - Higher flows overtop bank, distribute energy, and less likely to fail dam
  - Large Woody Debris (LWD), not pole lines
- Hydrology
  - Depths > 2-2.5’ preferred
  - Anomaly - lower depths due to staggered dams (tidal and non-tidal)

Further Study Needs

- Limited sample - additional sites recommended (e.g. Batwater and HGM reaches A + D)
- Re-visit sites across seasons, years, after maturity
- Water quality considerations – salinity in HGM Reach A
- Identify vegetation types
- Natural dams – what makes them persistent?

Management Implications

- Inform restoration practitioners – considerations
- Better BAS design efficiency – more beaver!

What can beaver do for you!

- Increased habitat capacity, floodplain connectivity
- Climate change anomaly resiliency
  - Native vegetation, groundwater recharge
  - Improved surface H_2O quantity & quality

Thank you contributors

- Colin Thorne, ESA
- Matt Schwartz, Chris Collins, LCEP
- Jason Smith, Tom Josephson, CREST

Questions?

References

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- Pollock, M.M., G. Lewallen, K. Woodruff, C.E. Jordan and J.M. Castro (Editors) 2015. The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Version 1.0 United States Fish and Wildlife Service, Portland, Oregon. 189 pp.
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- Macfarlane, W.W., J. Wheaton, M. Jensen. 2014. The Utah Beaver Restoration Assessment Tool: A Decision Support and Planning Tool. Final Report to Utah Division of Wildlife Resources.