Chehalis Basin Strategy: Reducing Flood Damage and Enhancing Aquatic Species

Aquatic Species Enhancement Plan

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Outline

1. Implementation

2. Approach

3. Data collection

4. Analytical framework

5. Analysis

6. Recommendation

1. Implementation - Roles

- Co-leads: Erik Neatherlin (WDFW) and John Ferguson (Anchor QEA)

- WDFW: Habitat Division and Science Division

- WDOE

- Anchor QEA, ICF International, Confluence, and BioAnalysts

- Chehalis Tribe is observing

Scope

- The ASEP will

  – Characterize key aquatic resources

  – Evaluate restoration and enhancement strategies

  – Evaluate the potential effects of flood reduction alternatives

- The analysis will cover the entire watershed, but will focus on WRIA 23

Deliverables

- Technical Memorandum: modeling approach (Oct 18)
- Report for economists: preliminary results (May 1)
- Technical Memorandum: data and gaps (draft May 1; final Aug 29)
- Ecosystem Diagnosis & Treatment (EDT; habitat) and SHIRAZ (fish population) models (draft May 1; final Aug 29)
- Technical Memorandum: ASEP (draft July 23; final Aug 29

Key Issues to Address

- Characterize scientific uncertainty

- Incorporate input from key stakeholders

- Identify additional studies needed to support future feasibility studies

- Relate results to regional management goals
  - Fish abundance
  - Habitat restoration
  - Environmental performance

- Present complex information

How to Present Findings – One Example of NOAA's Marine Ecosystem Indicators

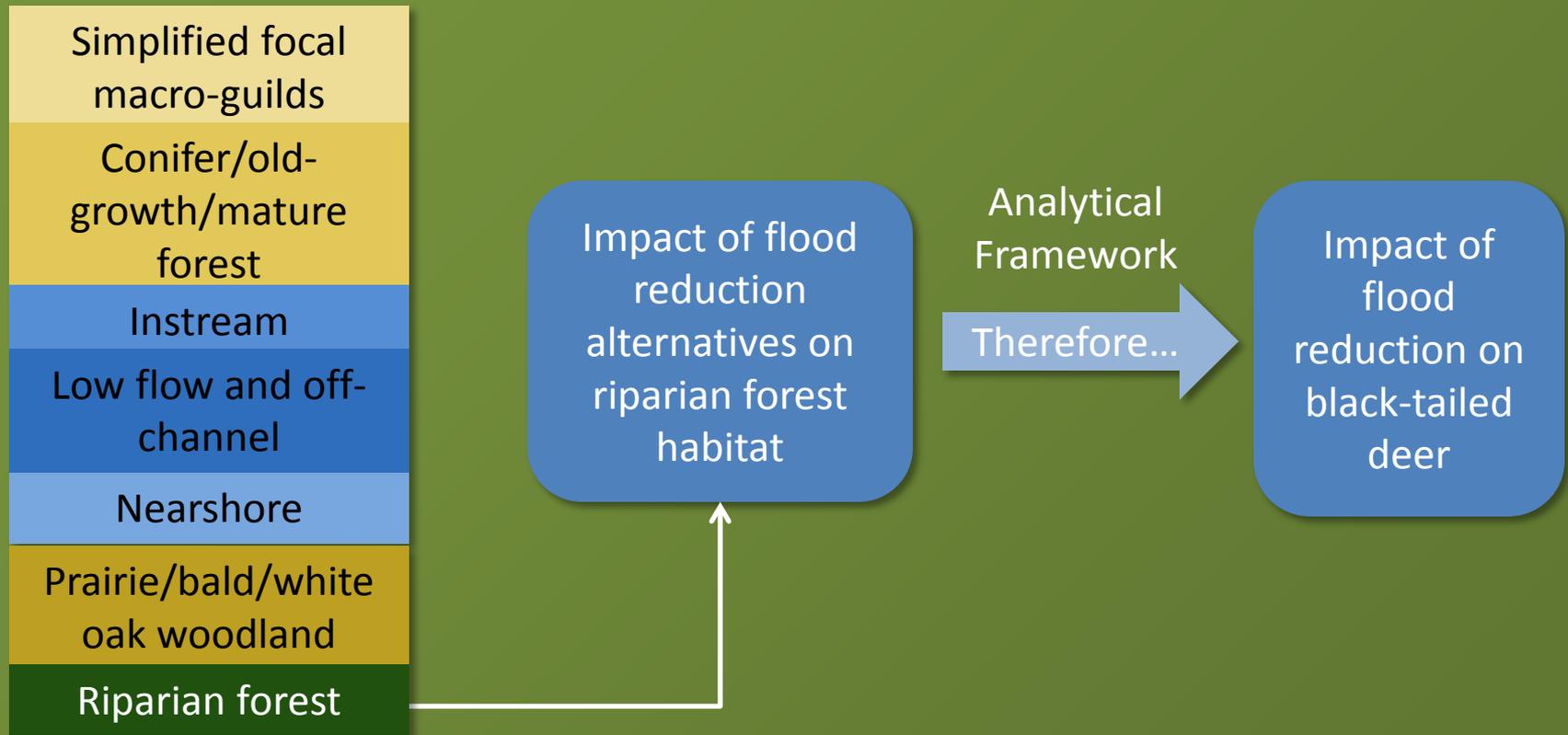| Ecosystem Indicators	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
PDO (December-March)	14	6	3	10	7	15	9	13	11	8	5	1	12	4	2
PDO (May-September)	9	4	6	5	10	14	13	15	11	12	2	8	7	3	1
ONI Jan-June	15	1	1	6	11	12	10	13	7	9	3	8	14	4	5
46050 SST (May-Sept)	13	8	3	4	1	7	15	12	5	14	2	9	6	10	11
NH 05 Upper 20 m T winter prior (Nov-Mar)	15	9	6	8	5	12	13	10	11	4	1	7	14	3	2
NH 05 Upper 20 m T (May-Sept)	13	10	12	4	1	3	15	14	7	8	2	5	11	9	6
NH 05 Deep Temperature	15	4	8	3	1	11	12	13	14	5	2	10	9	6	7
NH 05 Deep Salinity	15	3	6	2	5	13	14	9	7	1	4	11	12	8	10
Copepod Richness Anomaly	15	2	1	6	5	11	10	14	12	9	7	8	13	3	4
N. Copepod Biomass Anomaly	14	10	6	7	4	13	12	15	11	9	3	8	5	1	2
S. Copepod Biomass Anomaly	15	3	5	4	2	10	12	14	11	9	1	7	13	8	6
Biological Transition	14	10	6	5	7	13	9	15	12	2	1	4	11	3	8
Winter Ichthyoplankton	15	7	2	4	5	14	13	9	12	11	1	8	3	10	6
Chinook Juv Catches (June)	14	3	4	12	8	10	13	15	9	7	1	5	6	11	2
Coho Juv Catches (Sept)	11	2	1	4	3	6	12	14	8	9	7	15	13	5	10
Mean of Ranks	13.8	5.5	4.7	5.6	5.0	10.9	12.1	13.0	9.9	7.8	2.8	7.6	9.9	5.9	5.5
RANK of the Mean Rank	15	4	2	6	3	12	13	14	10	9	1	8	11	7	4
Principle Component Scores (PC1)	6.56	-2.22	-2.95	-1.60	-2.12	2.08	3.12	4.21	1.10	-0.30	-4.39	-0.91	1.13	-1.76	-1.96
Principle Component Scores (PC2)	-0.51	0.04	-0.24	-0.76	-1.96	-1.53	2.55	-0.43	-0.66	1.07	-0.50	0.96	-0.74	1.36	1.35
Ecosystem Indicators not included in the mean of ranks or statistical analyses															
Physical Spring Trans (UI Based)	3	6	14	12	4	9	11	15	9	1	5	2	7	8	13
Upwelling Anomaly (Apr-May)	7	1	13	3	6	10	9	15	7	2	4	5	11	13	11
Length of Upwelling Season (UI Based)	6	2	14	9	1	10	8	15	5	3	7	3	11	13	11
NH 05 SST (May-Sept)	10	6	5	4	1	3	15	13	8	12	2	14	9	7	11
Copepod Community Structure	15	3	5	7	2	12	11	14	13	8	1	6	10	9	4

2. Approach to Evaluating Biological Effects of Actions

1. Develop aquatic and terrestrial species list
   - 47+ terrestrial and wetland species
   - 30 fish species

2. Group species into Guilds: Groups of species that use the same habitat in similar ways
   - 6 terrestrial/wetland macro-guilds
     - E.g., old-growth forest
   - 18 fish/aquatic guilds
     - E.g., medium-river gravel/cobble-cool water

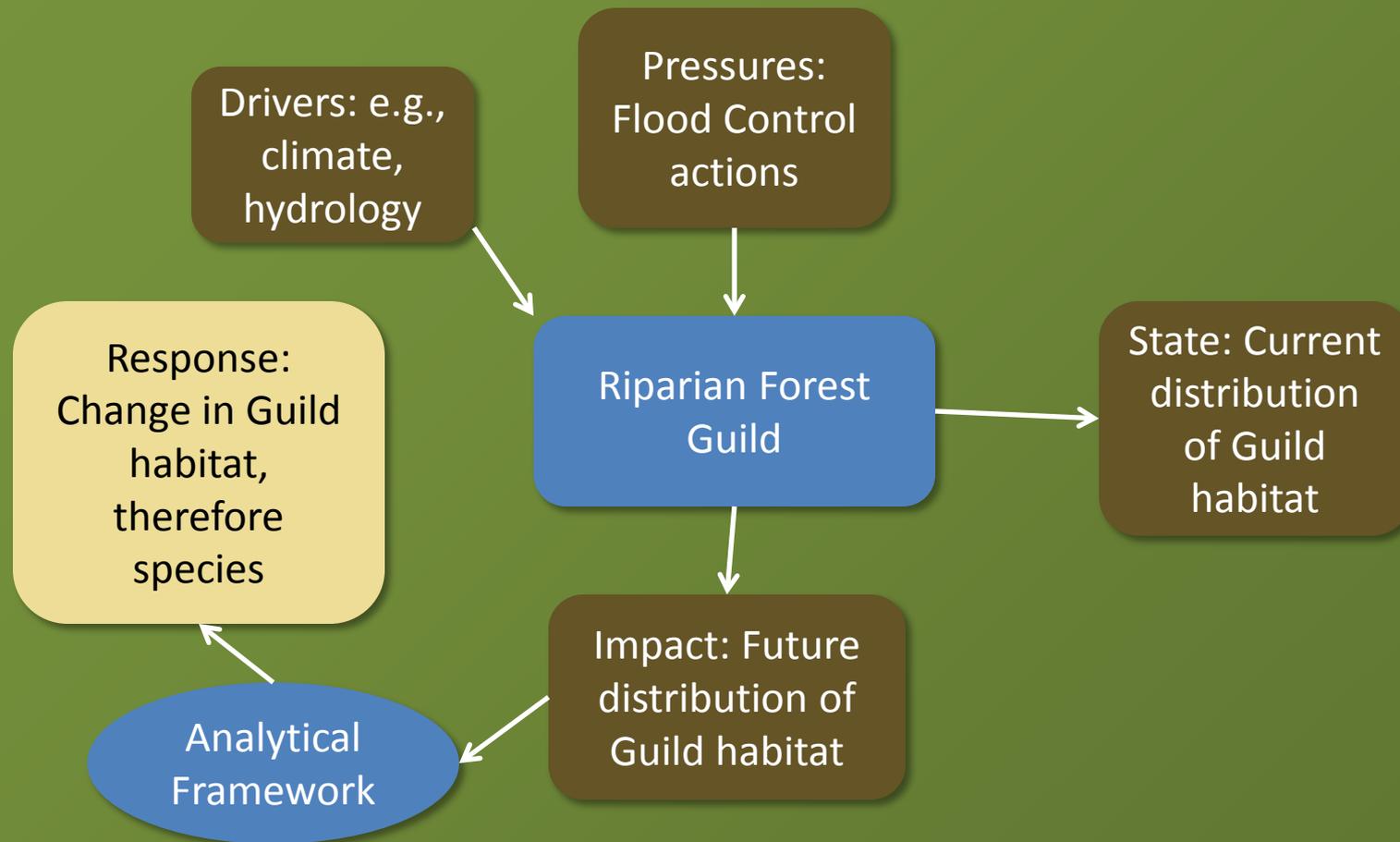- Purpose of Guilds: Biological unit for associating impact of actions

Approach to Evaluating Biological Effects of Actions (cont.)

3. Map current terrestrial, wetland, and aquatic habitats

4. Determine change in habitat due to dam, reservoir, or other actions
   – GIS/Hydrology

5. Link habitat change to Guild/species performance
   – Salmonids-EDT/SHIRAZ
   – Information-rich species: "HSI"
   – Information-poor species: Associations within Guilds

Approach to Evaluating Biological Effects of Actions (cont.)

| Simplified focal macro-guilds |
| Conifer/old-growth/mature forest |
| Instream |
| Low flow and off-channel |
| Nearshore |
| Prairie/bald/white oak woodland |
| Riparian forest |

Impact of flood reduction alternatives on riparian forest habitat

Analytical Framework

Therefore…

Impact of flood reduction on black-tailed deer

Evaluation of Actions on Guilds: DPSIR

3. Data Collection

- ASEP Objectives 1 – 5 are descriptive:

    – Gather information

    – Incorporate additional data being collected by WDFW and Chehalis Tribe

    – Develop analytical approach based on the available information

- Objective 1 (purpose and scope) already covered

Objective 2: Current and Historical Structure of Key Fish Populations

- Identify focal species (n = 15)

- Identify where sufficient data exists to support more quantitative analyses (n = 6)

- Develop species profiles

- In general, information for salmon is much more developed than for other species

Objective 3: Viable Salmon Population Characteristics

- Developed by NOAA Fisheries to evaluate population status

- Parameters are attributes that contribute to viability

  - Abundance (numbers)

  - Productivity (adult returns per spawner)

  - Biological diversity (life history diversity)

  - Spatial structure (number and distribution of populations across the landscape)

- Sufficient information exists on salmon and steelhead

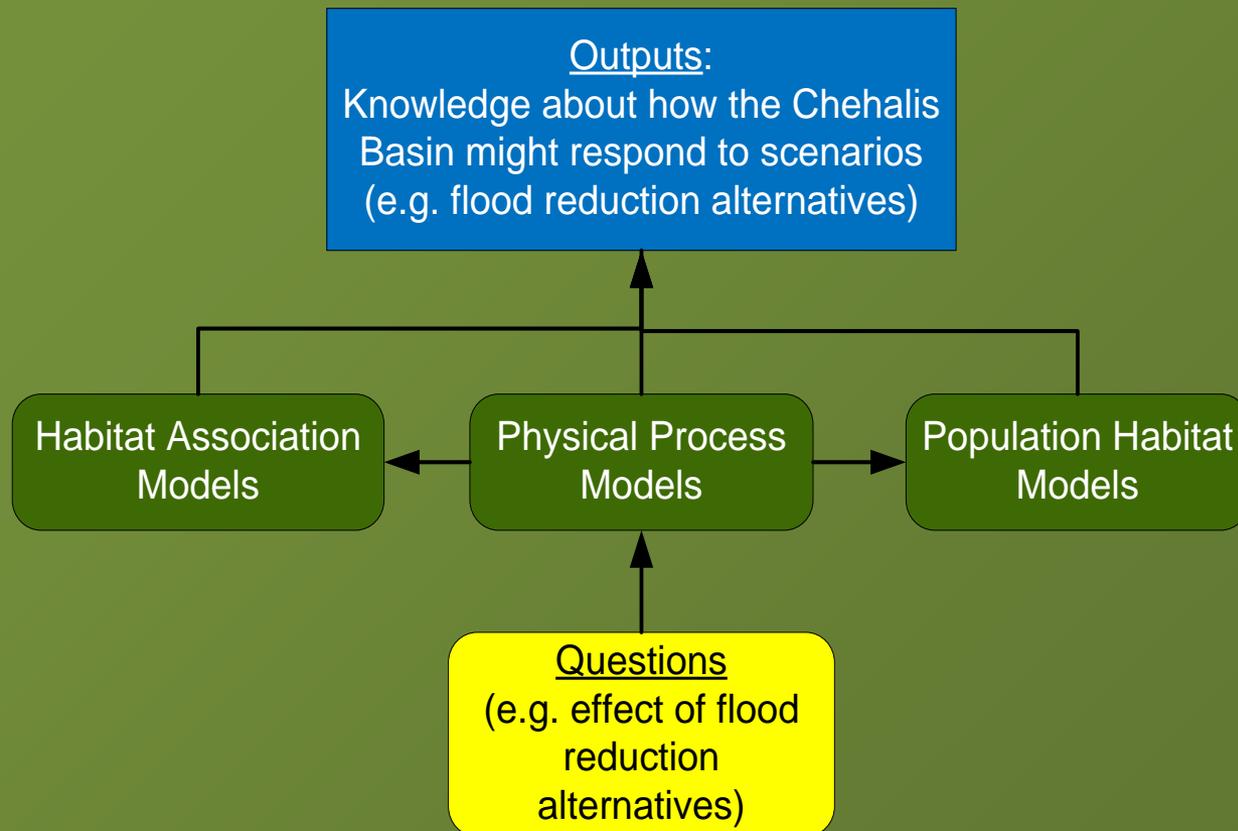# Objective 4: Identify Data Gaps and Data to Fill These Gaps

- Survey available data and and incorporate into the analyses

- Identify key data gaps and discuss ways to fill them
  - Expert opinion
  - Scientific literature
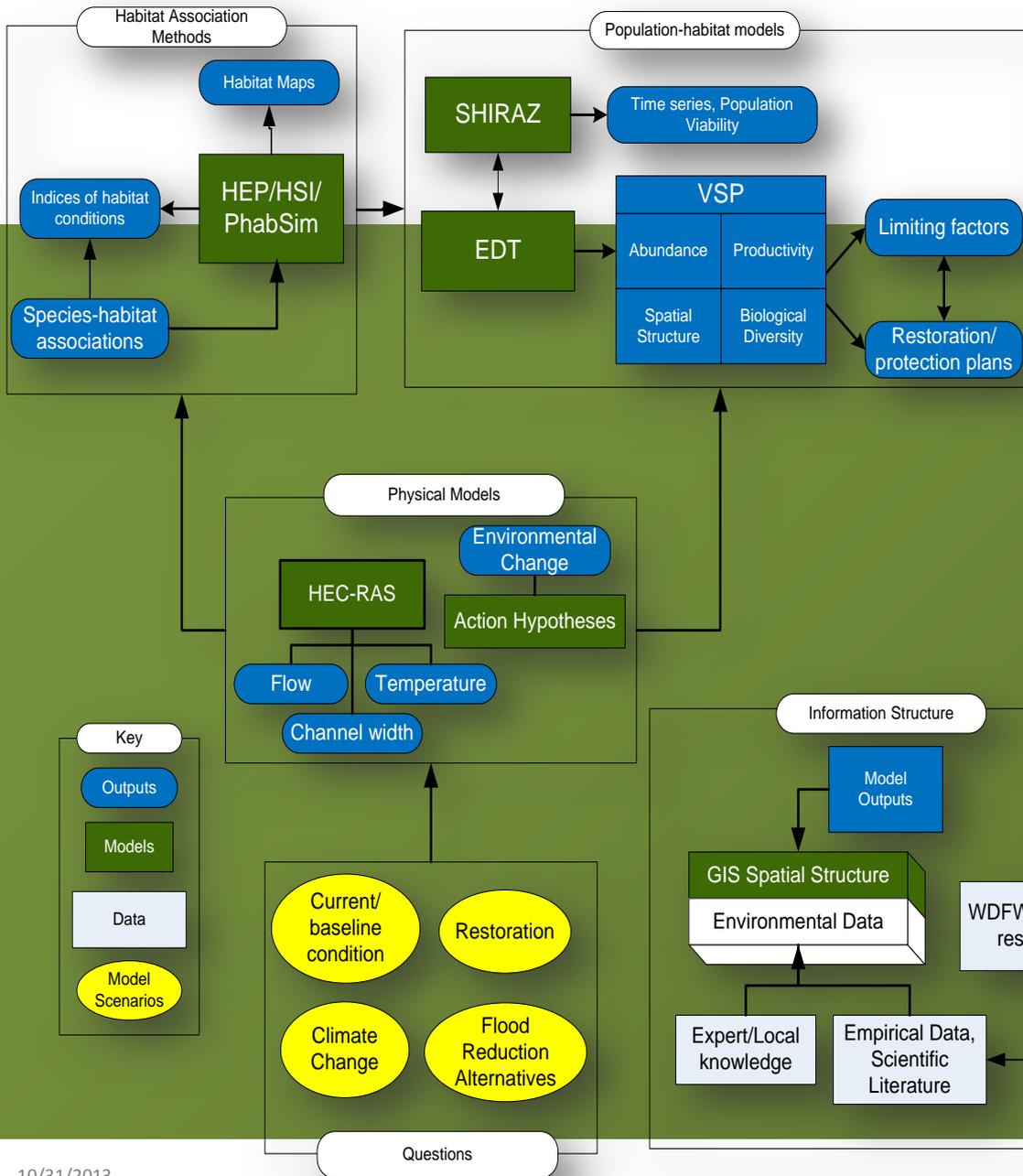 - Statistical methods

- Identify Phase 2 field studies

Objective 5: Habitat Factors Currently Limiting Fish Populations

- Habitat quality affects productivity and survival

- Habitat quantity (capacity) affects abundance and distribution

- Use literature (e.g., Smith and Wenger 2001) and a range of modeling approaches (Delphi, HSI to EDT/SHIRAZ) and evaluate which environmental conditions have the greatest effect on modeled species performance

4. Analytical Framework (Objective 6)

ASEP Analytical Framework Concept

Outputs:
Knowledge about how the Chehalis Basin might respond to scenarios (e.g. flood reduction alternatives)

Habitat Association Models

Physical Process Models

Population Habitat Models

Questions
(e.g. effect of flood reduction alternatives)

ASEP Analytical Framework

5. Analysis

- Objectives 7 - 9: Analysis using the framework

  7. Identify actions to address habitat limiting factors

  8. Evaluate project alternatives (dams; I-5; small structures)

  9. Incorporate climate change

Objective 7: Identify Actions to Address Habitat Limiting Factors

- WDFW, Chehalis Tribe, and others have identified habitat restoration needs and opportunities

- Objective 7 will analyze proposed actions that address identified factors limiting fish and wildlife species (Objective 5)

- Result is a prioritization of restoration and protection actions by species or guilds

Objective 8: Analysis of Flood Hazard Reduction Alternatives

- Alternatives evaluated individually (e.g., water retention structure) and in combination (e.g., water retention and I-5 structures)

- Forecast population trends through 2100 to incorporate climate change (Objective 9)

- Compare between alternatives (A vs. B)

- Compare multiple groups to assess the relative impacts of each alternative (A has greater effect on low-flow/off-channel habitats than B)

Objective 9: Analysis of Climate Change

- Develop conceptual models on potential effects

- Use projections of changes to flow and water temperature (literature, Climate Impacts Group)

- Incorporate projections into EDT and SHIRAZ

- Assess salmon population responses to alternatives and scenarios

- Identify habitat restoration actions that are resistant or resilient to projected changes

6. Recommendation

- Use the Guild approach and analytical framework discussed here to implement the ASEP

Questions?

Extra slides

Schedule

- October - January: Gather data, develop approach, develop models

- February - March: Conduct analysis

- March - August: Write report; address review comments; refine analysis and results

- Fall 2014: Communicate with stakeholders

Scope of the Request for Proposals

- Objectives 1 - 5: Gather information and develop an approach based on the available information

- Objective 6: Construct an ecosystem modeling framework

- Objectives 7 - 9: Analysis using the framework
  7. Identify actions to address habitat limiting factors
  8. Evaluate project alternatives (dams; I-5; small structures)
  9. Incorporate climate change